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The best games past and future

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Against All Odds—
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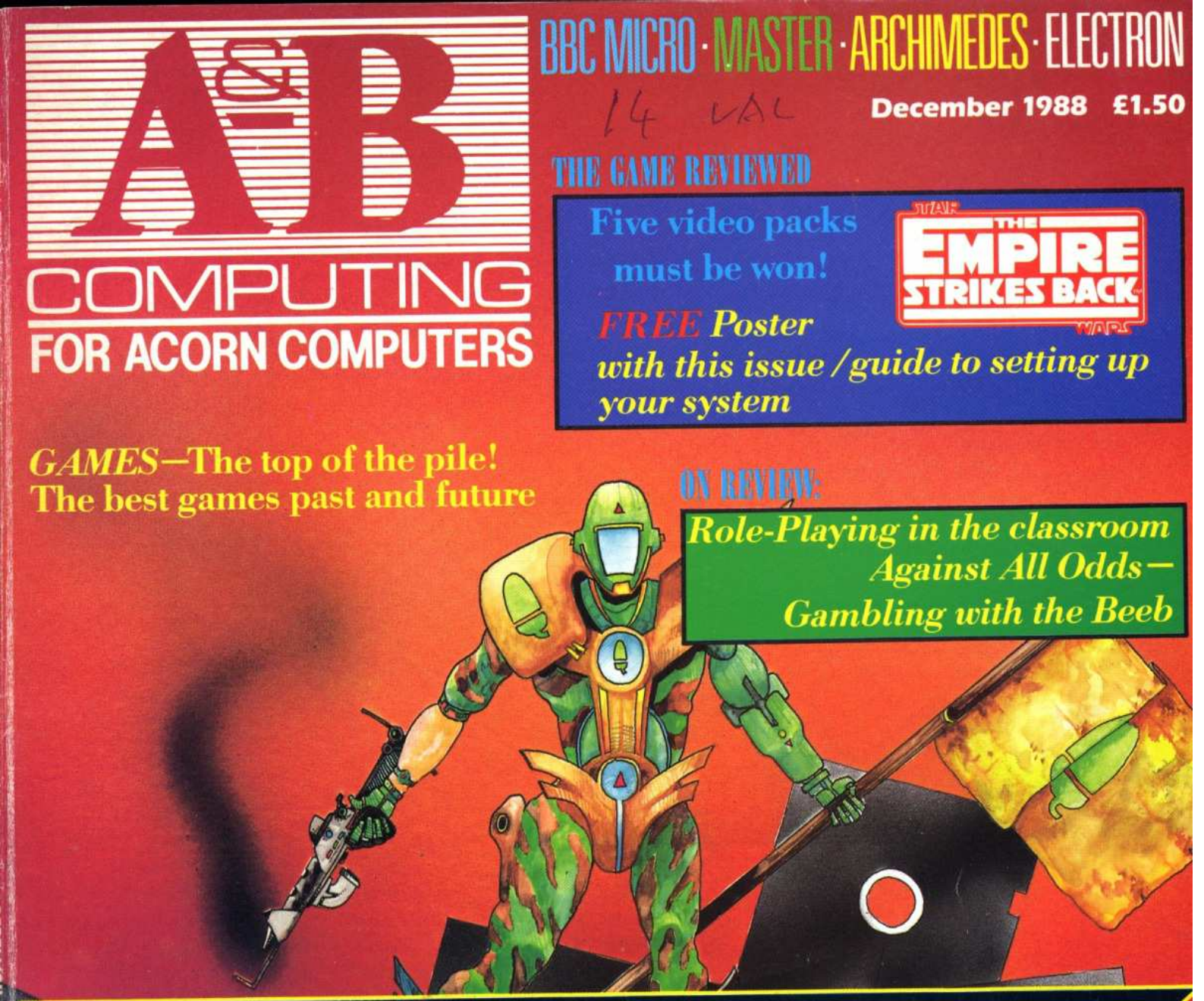

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Archimedes

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Programs for the BBC model 'B', B+, Master and Master Compact with disc drive

DIAGRAM II – now also available for ARCHIMEDES

Diagram II is a completely new version of Pineapples popular 'Diagram' drawing software. The new version has a whole host of additional features which make it into the most powerful and yet quick to use drawing program available for the BBC micro. The new features mean that 'Diagram II' can now be used for all types of drawings, not just circuit diagrams. Scale drawings are possible and the facilities for producing circles and rubber banded lines together with the pixel drawing routines make any type of drawing possible. This advert has been produced completely using Diagram II.

Summary of Diagram II features:-

1. Works on all model BBC computers and makes use of Shadow memory if poss.
2. Rapid line drawing routines with automatic joins for circuit diagrams.
3. Rubber band line and circle drawing modes.
4. Makes use of the Acorn GXR rom to produce ellipses, arcs, sectors, chords and flood filling.
5. Pixel drawing mode allows very fine detail to be added.
6. Defined areas of screen may be moved, copied, deleted or saved to disc.
7. On-screen cursor position indication allows scale drawings to be made.
8. Keyboard keys may be defined to print User Defined Characters allowing new character sets to be used.
9. Wordprocessor files may be loaded and formatted into defined areas.
10. Up to 880 UDC's if shadow memory available, 381 without shadow.
11. Compatible with Marconi Trackerball and most makes of 'mouse'.
12. All 'Diagram Utilities' are included.
13. Completely 'scaleable print routines allow any area of the diagram to be printed either horizontally or through 90deg. in scales that may be varied in 1% steps allowing up to 18 mode 0 screens to be printed on an A4 sheet (still with readable text).
14. Smooth scrolling over the whole area of the diagram.

Diagram II consists of a set of disc files and a 16k Eprom. The disc is formatted 40T side0 and 80T side2. Please state if this is unsuitable for your system, or if you require a 3.5" Compact disc

DIAGRAM II – £55.00 + vat P & P free

MARCONI TRACKERBALL

For Model 'B' and B+ (with Icon Artmaster)	£ 60.00	+ vat
For Master 128 (with Pointer Rom)	£ 60.00	+ vat
Bare Trackerball (no software)	£ 49.00	+ vat
Pointer Rom (available separately)	£ 12.50	+ vat
Trackerball to mouse adapters	£ 8.00	+ vat
Postage and Packing on Trackerballs	£ 1.75	

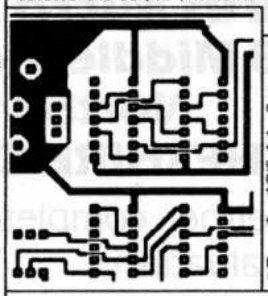
All orders sent by return

PCB

Pineapple's now famous PCB drafting aid produces complex double sided PCB's very rapidly using any model BBC micro and any FX compatible dot-matrix printer.

The program is supplied on Eprom and uses a mode 1 screen to display the two sides of the board in red and blue either separately or superimposed. Component layout screens are also produced for a silk screen mask.

The print routines allow a separate printout of each side of the board in an expanded definition high contrast 1:1 or 2:1 scale. The print time is typically about 5 mins. for a 1:1 print of a 7" x 5" board. This program has too many superb features to adequately describe here, so please write or 'phone for more details and sample printouts.



£85.00 + vat Plotter driver to suit most plotters £ 35.00 +vat

PCB AUTO-ROUTING

This brand new addition to the PCB program greatly increases the power of the software and speeds the design of PCB's even more.

A list of up to 190 connections may be entered in the form of a 'rats nest' and then the computer does the rest! You may specify which side of the board you wish a track to be on or you may leave the choice to the computer, and you may also say whether tracks should be allowed to pass between I.C. pins.

The program is in the form of a second Eprom and full features are available on a standard model 'B.'

Please write or 'phone for full details.

COMPLETE AUTOROUTE PACKAGE (Including manual Eprom) £185.00 + VAT

ADFS Utilities Rom

ADU is an invaluable utility for all ADFS users. It adds over 22 new *commands to the ADFS filing system as well as providing an extensive Menu facility with over 35 sub commands covering areas such as repeated disc compaction, saving and loading Rom images, auto booting of files and many more.

Copying of DFS discs onto ADFS discs can be made in one pass with automatic creation of the required directories on the ADFS disc. All functions are fully compatible with Winchester drives including *BACKUP which allows backing up of Winchesters onto multiple floppies.

New *commands are as follows:- *ADU, *BACKUP, *CATALL, *CHANGE, *DFSADFS, *DIRALL, *DIRCOPY, *DIRDESTROY, *DIRRENAME, *DISCEDIT, *DRIVE, *FILEFIND, *FORMAT, *KILLADU, *LOCK, *MENU, *PURGE, *PURBRK, *UNLOCK, *VERIFY, *VFORMAT, *WIPE

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Archimedes
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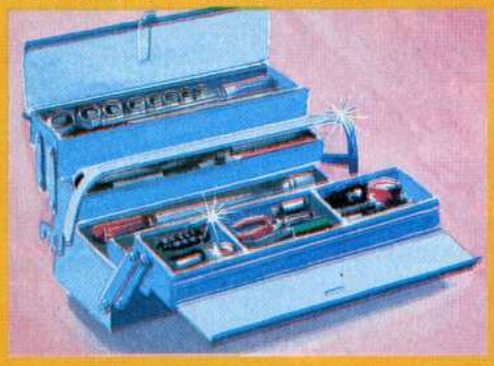
* 10 Fast memory and disc editors
* 8 Fast memory and disc searches
* Fast scrolling disassembler
* Memory shift, swap and compare



Plus

* AGET & APUT disc sectors
* FASTLOAD & FASTSAVE of screens
* A series of commands to list all SWIs, give SWI numbers for names and names for numbers.

Plus

A host of commands to search a disc for filenames including wildcards, specified filetypes, files between specific dates or a combination of these parameters, For instance you could search a disc for all BASIC files starting with DEMO and saved between 1/1/88 and 2/2/88.

Plus

ARCHIVING so that you can backup files matching the specified criteria above. You can then archive the files on your hard disc to floppies for safety.

You need TOOLKIT+ so order today.

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Also from Mike Shaw, the author of Toolkit+, comes a buffer module. This has buffers for the printer, serial input and serial output. Each buffer can be configured form 256 bytes upto 1 megabyte. Whilst data is being printed you can carry on working on your computer.

You can get control back from your printer in a fraction of the normal time. Printouts that take a printer 4 or 5 hours to print can be put in the buffer in minutes and you can then carry on working on your computer. If yo want to save time get this module now.

Compatible with 305, 310, 410 and 440.

Artisan

£39.95

ARTISAN is not just an art package it is THE art package for the Archimedes. We are not going to bore you with lists of features, just take a look at the picture to see how good it is. Just to prove that we aren't the only ones who think its good take a look at what the magazines think:

a sophisticated graphics package... **ARTISAN** is a true load and go program... A real first for **ARTISAN** is it's magic brush'. Its effects have to be seen to be believed... It's friendly and foolproof...**ARTISAN** operates at a lightning fast speed... It's streets ahead.

ACORN USER February 1988

ARTISAN is a highly superior product... very classy... the manual clearly explained all the many features... go on buy this package now.

RISC USER November 1987

ARTISAN makes the Archimedes superb... a truly professional product... The possibilities are endless. I can certainly recommend **ARTISAN**

MICRO USER January 1988

deserving of special mention is a facility called Magic Brush... a true cut and paste... '**ARTISAN**' wins hands down.

ARCHIVE February 1988

ARTISAN represents excellent value for money... superbly designed pop up menus... very friendly, foolproof and quick to use... incredibly easy to use... Instantly appealing... superb features...the Magic Pen is unique to **ARTISAN**... Quantel would have been justified in getting a little upset... well organised...

A & B December 1987 & January 1988

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  * **PATTERN EDITOR** for mono dumps
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Volume Five Number Twelve December 1988

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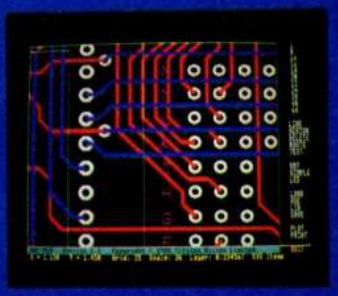

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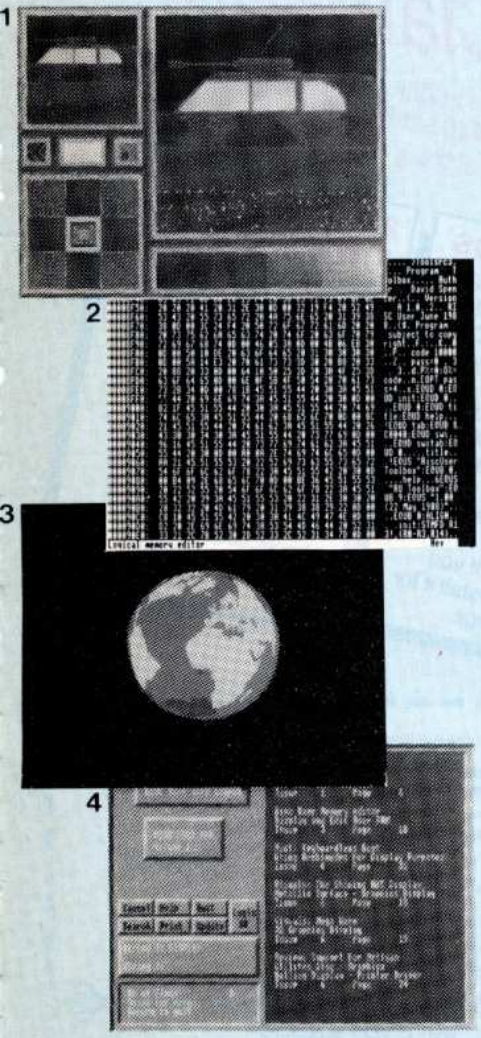

1 Pixel Editor

This powerful drawing tool is a full-screen full-feature pixel editor, for creating and editing screens and sprites.

2 Toolbox

This incredibly useful utility features a memory editor, memory search and replace, disc editor and disassembler. TOOLBOX contains many of the features found in packages costing over £35.

3 World in Motion

A stunning animation with an oddly reminiscent feel to it.

4 Arcscan

A fast on-screen bibliography with powerful search facilities for all the RISC User and BEEBUG magazines published. Normal price £12.

5 Disc Menu Module

Use the mouse to control your disc files with this extremely useful relocatable module.

6 Printer Buffer

This printer buffer frees your computer during long printouts and is configurable from a few bytes to 4 Mbytes. Similar to packages currently selling at £19.

Altogether the items on this disc would be worth over £50 if bought separately.

This is what you've missed in volume1

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310		912.24	76.24	440		2762.93 232.93
310	MONO	977.79	86.79			
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The exciting new multi-tasking operating system for Archimedes, RISC OS, will be available early in 1989. Purchase an Archimedes under this scheme and you will be one of the first in the country to receive RISC OS, as soon as it becomes available. Your copy will be sent to you to install, or if you prefer, we will install it for you free of charge.

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BEEBUG – The Archimedes Specialists

Introducing

Showpage **is designed specifically for the generic ARM RISC processors, and offers a fast, industry standard graphics description language for use on printers and/or for interactive screen use.**

The PostScript™ graphics language has, unfortunately, become the *de facto* standard for driving laser printers and typesetters are queing up to have their machines (including Linotype) converted to read this relatively new standard for DTP page and laser printing.

By providing a Postscript compatible environment across all I/O devices currently served by the RISCard, it is possible to have very high quality output printed from a professional printer – yet merely sent down as a file on disc!

Naturally we are keeping a very close and beady eye on this hardware, it is of great use to people writing their own advertising leaflets, writing books, technical journals and, if you require the effort and hardware involved – a great DTP workstation, able to make the most of on-screen DTP applications using Risc based technology to do the donkey work.

Naturally the PC show was not the place to show off this equipment, but CC have produced a very nice set of leaflets detailing the hardware and software involved should you be interested – but it is a pricey system especially when put up against Acorn's Desktop Publishing package.

● Contact: Computer Concepts. Gaddesden Place, Hemel Hempstead, Herts, HP2 6EX. ☎ (0442) 63933. FAX (0442) 231 632.

RiscFORTH – also from Silicon Visions

Well, someone had to be the first to do it, and Silicon Visions have the dubious honour of being the first company to produced a version of FORTH – the Archetypal control language for micros, – this version is just for the Archimedes!

RiscFORTH is a new 32 bit implementation of the FORTH-83 standard, "designed to take full advantage of the ARM Architecture". The advantage that RiscFORTH has over other languages like "C", "Pascal", and "Prolog" is that FORTH is able to multi-task easily (although I am not sure how the new RiscOS applies to this).

Silicon Visions must surely win an award for being faster than the FORTH Interest Group's bunch of dilligent hackers – hell bent on spreading the worth of FORTH on every possible computer ever imaginable, you name the machine, the processor or the postcode of a computer company, and I reckon there's a version of FORTH lurking around it!

Another Genealogy Package Resurrected

Well, perhaps the term resurrected is a bit strong, but BEL TECH Ltd have recently launched their family history package called **Heritage** for the BBC Micro.

Having taken some two and a half years to develop the package, Bel Tech tell me that they are confident that their program is the most compact and powerful genealogical tool on any computer.

Quite a claim. But they seem to be able to back it up by listing the following advantages:

Automatic creation and linking of parents, spouse(s) and children's records. An on-screen index in a window, The option to use the Julian or the Gregorian calendar for England, Scotland and the continent.

I could write on for hours about these packages because I have a personal interest, but following on from last month's news item regarding the timely re-release of Micro-Aid's package, it seems somehow ironic that Bel Tech are considering putting it on the IBM PC!

● Contact: Bel Tech, College House, St Leonards Close, Bridgnorth, Shropshire ☎ (0746) 765 420.

ParaCAD – A "Workstation" CAD Package

By Gordon Taylor

PDT (Parametric Design Tool) is a new 2D CAD package written for the Archimedes by *Oak Professional Software* (reviewed last month – see Archimedes Report).

Whilst PDT can run on an Archimedes 310 – and in Mode 12 with a standard monitor – it was shown running on Arc 440 series machines, and in Mode 20 with a multi-frequency monitor. It thus attracted a great deal of attention – notably from people looking for workstation CAD systems.

Amongst the additional features, ParaCAD, Oak's latest package will include a built-in translation facility, to transfer data to (and from) other formats including HGPL, DXF and IGES. It will also support the parametric parts libraries for architectural, mechanical and electronic parts etc. These libraries allow the drawing data to be held in far less space, and to be accessed from a database by part, number, or size.

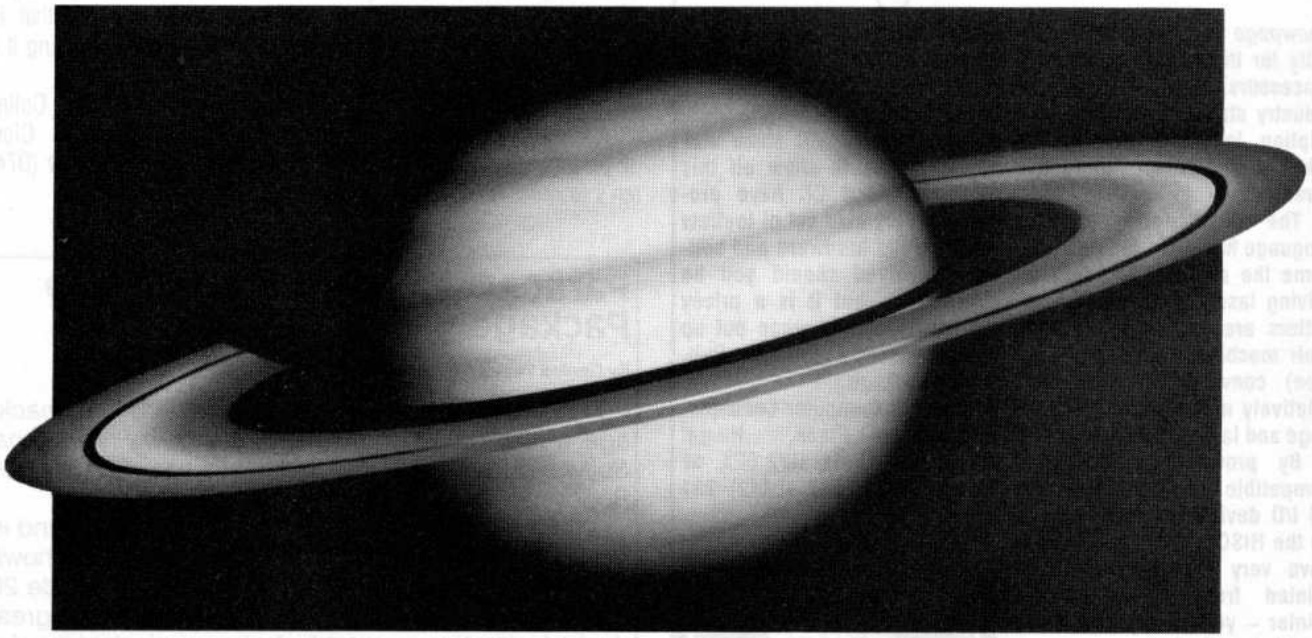
ParaCAD will also include a built-in programming language based on Pascal – this will allow the creation of more complex drawings and faster creation of simulations and sequences of snapshots for animated movies. The language will also enable the features and user interface of ParaCAD to be extended – both by the user and third parties; moreover, even when running as a background task under RiscOS, the language will allow ParaCAD to produce complete drawings from a parametric definition, together with a set of values taken from a database.

With these and other enhancements, Oak claim that their ParaCAD will be the world's most powerful 2D CAD package, they expect the price to be around 3500. This is just less than AutoCAD, and only half that of the Hewlett-Packard ME-10 workstation CAD package. Both these require much more expensive hardware. Existing users of PDT will be able to upgrade to ParaCAD for the difference in price, and both will be available at lower prices to educational establishments.

● Contact: Oak Professional Software ☎ (0532) 502615.

STAR TREK OR

(What other micro has



Dr C J Baddiley has written many astronomical simulation and graphical analysis programs on his BBC microcomputer, including an accurate relativistic space flight simulator for journeys between real stars and galaxies, with high resolution graphics and clock and distance displays. It shows dramatic effects never seen in films. "The increase in speed of this program running on an Archimedes system is truly staggering," Dr Baddiley explained. "A two million light year journey from Andromeda galaxy to our Sun of twenty-nine years duration shows as a two minute continuous animated sequence."

The manager of a footwear retailing company stated: "I can monitor sales quickly and easily by size, style and colour enabling me to avoid the 'out-of-stock' situation that I suspect was losing me business in the past."

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STOCK CHECK

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ORPORATION MICROCOMPUTER

The Times Computer Crossword

Orandum est ut sit mens sana in corpore sanc wrote Juvenal and, in traditional fashion, **The Times** and **Sun Computer Crosswords** volume two hits the computer shops just in time for Christmas.

After a few laudable reviews of the *Times Computer Crossword – volume one*, David Akenhead, the author of the original package, has told us of a new set of packages released by Akom Ltd for the BBC Master to supplement the original, highly successful software packages released last year.

These new packages are Volume 2 and 3 in the same series along with the Jubilee Puzzles from 1932-1987 as well as the Sun Computer Crosswords volumes 1 – 4.

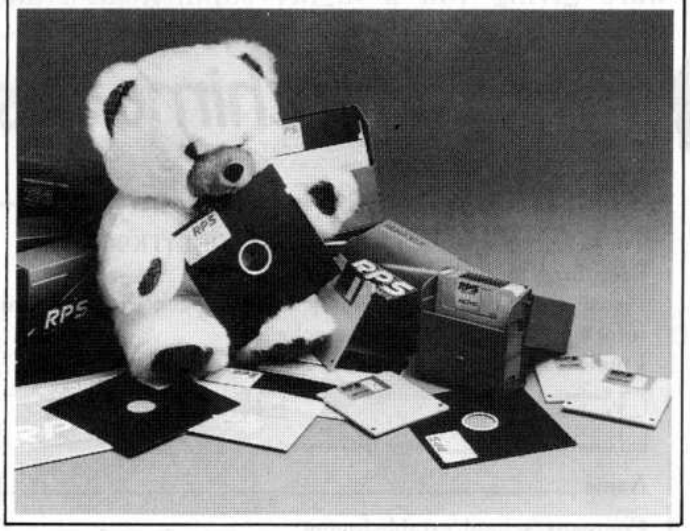
Okay, so the Sun crosswords are not of the same calibre as the Times' ones, but they still offer a lot pleasure for our younger readers, and neophytes will enjoy a clue by clue help facility designed to help with the art of cryptic puzzle solving in the harder Time crosswords. They all have four levels of play and points are awarded according to level and an invisible clock times your performance.

The nicest thing about this software is the price – 16.95 for the *Times* discs, whereas the *Sun* discs are around 15.95. Tapes are around 10 each, and they look just the thing to wile away the long Christmas evenings (as well as the long November ones – of course).

● Contact: Akom Ltd, 51 Manour Lane, London, SE13 5QW. ☎ (01) 352 4575.

Cutie Wootie!

Christmas time is here again, (as was rammed home by this particular release from RPS). Those awfully nice disk people are giving away one of two cuddly Teddy Bears when you buy loadsa Disks from them. The one in the picture is *Scotty Bear* who appears to be frantically looking for his copy of Global View.



Topologika Goes 3½

Good news for Compact owners who are into text adventures. Topologica are now marketing *Philosophers Quest, Acheton, Kingdom of Hamil, Giant Killer, Countdown to Doom* and *Return to Doom* are now all available on 3½" Format.

Even better news is that many of these titles are in the pipeline for the Arc.

The bad news is that nothing works with the Electron. Sorry guys!

Anyway, if you'd like a freebie catalogue then send an SAE to Topologika FREEPOST (no stamp required), PO Box 39, Stilton, Peterborough PE7 3RL

Master Genlock

Interactive Media have just launched a genlock and near broadcast quality PAL encoder for the BBC Master.

The GL2000P will cost around 700 ex VAT including the small modifications required to run the unit. To find out just what a Genlock can do see our October issue.

For those of you who just want PAL encoding IMR also produce the Datavid(M), also for the Master, retailing for 250 ex VAT.

● Contact Interactive Media Ltd, 8 North Street, Wolverhampton, West Midlands WV1 1RD ☎ 0902 25444.

Free ROM from ESM

ESM are offering a free Screenprint ROM when you buy a set of four at a price of 99.00.

This will not only be useful to Educationalists, but also people in computer clubs where four people can get together in order to get a cheap screendump ROM which, along with 4-Mation's *Snatch* is one of the best printer utilities available.

If you want to take advantage of this offer call Clifford McCullough on ☎ (0223) 65445.

New languages from Silicon Visions

Just weeks after the news of the DABS press compiler (reviewed in this issue), news arrives that Silicon Visions, innovators of graphics software with their **Realtime Graphics Language,** (extensions are called *The Realtime Solids Modeller* and *SoliCAD*) have just released RiscBASIC – a BASIC V compiler for the Archimedes.

According to Silicon Visions, this package supports the entire BASIC V syntax apart from the EVAL keyword. It can create relocatable modules, has full BASIC V syntax implementation, has no limits on variables and array sizes and dimensions, it can cross reference all variables, PROCs and functions, it supports the Floating Point Emulator, and is based around an optimising compiler with a stand alone code generator.

The Compiler costs 99.95 inc.

Smalltalk-80 finally makes it for the Arc

At the Millcom show was a *very* impressive implementation of Smalltalk-80, the object orientated language Smalltalk-80 Virtual Machine. The product was simultaneously launched in San Diego, USA – hopefully pitching the Archimedes squarely at the bottomend of the "power user" market.

Smalltalk claim that Smalltalk-80 on an Archimedes 440 machine currently runs at comparable speeds to that of a SUN 350 workstation and they are planning to take it even faster still! Applications include character recognition and image processing systems.

At the moment, Acorn are not making too much fuss about the fact that an intensive operating system has been implemented on the top-end Archimedes – this is probably because Milcomp and the PC show were fairly close together, and Acorn wanted to push the RiscOS operating system as far as possible – but the implementation of Smalltalk is a major step in getting 32 bit technology into the cheaper end of military computing (let's face it, a 3000 computer system isn't going to break the military's back now is it?).

SmallTalk is a very important step in the evolution of the 440 series, it may help to sell the machine to America where SmallTalk is quite successful – There aren't visions of Acorn taking on IBM for defence contracts yet, but it is a start, and SmallTalk is a pretty good start by all accounts.

Acorn Shows off RiscOS at PC Show

Acorn quite literally stole the show at the PC show back in September with their enhancements to the operating system of the Archimedes. Now offering multi-tasking at a fraction of the cost of comparable machines!

Named simply RiscOS, it allows true multitasking applications to be run simultaneously within windows. Information, pictures and text can be transferred across applications instantaneously by "Icon Dragging", (a process more akin to the Mac and is a facility *not* readily on the Amiga or ST).

But Acorn haven't just taken a tired and tried and trusted idea (nee WIMPS) and made them pretty, no, Acorn have added a whole host of wonderful new upgrades – well worth the 80 cost for the EPROMs and fitting.

What features you may ask? – How about a decent alarm clock that (providing you can crank your Archie's sound output to anything more than a gnat's buzzing) will integrate with any other major application running on the desktop. The desktop has been vastly improved, now it is possible to get the machine up and running simply from the desktop, with a intuative and intelligent environment – for example, when no run actions for a file have been specified, the damn thing will *find* one for you (so you don't have to exit the desktop and type *EXEC !BOOT or whatever).

A neat little gadget is the magnifying glass – a popular add on piece of software for the Amiga, but an integral part of the RiscOS desktop. This saves the time needed to zoom a window up to its full size and it should prove very useful when there are many windows in use.

Oh yes, the cursory calculator has been added to, and improved, vastly since the earlier version for the Arthur OS – dare I say it, but I think I have actually found it useful! (You would – Ed).

Three multi tasking applications have been bundled with the software. These include a sophisticated text editor that can be used to create text files without having to stop other files, and while I haven't exactly had long to play with the new OS, I am very pleased to say that the Amiga is now in a sorry state when you compare it to Commodore's slow and bug-filled Workbench.

The very nice thing about this software is that The Arc's memory management is now totally under control of the desktop. There is now a RAM filing system for those of you with obscene amounts of memory, and more screen modes have been introduced (this last snippet was taken from a press release and I am still not sure how accurate it is).

A new Emulator has been bundled with the Welcome disc – called *65Host*, it will allow many programs to run that make use of specific aspects of the Model B and Master – a shame, as A&B had just about got ready to release a version of the emulator that did just that, and enabled games players to load up *deprotected* versions of games like *Galaforce* on their machines and play them as if they were running on a 1.5 Mhz 6502. Still, if a benchtest shows that BBC Micro machine code games will not run on the Arc under the new emulator, then we'll most certainly put it into commission – hold tight for the review of the OS.

You are going to want a lot of memory for this one. As Bruce Smith mentions in his comment section "Bruce!", The software works best on one Megabyte (or more) machines, and it could do with a second drive as well!

No, I know the photo isn't all that brilliant, but that's the best we got from Acorn given the time scale.

Fax and DTP Come Together

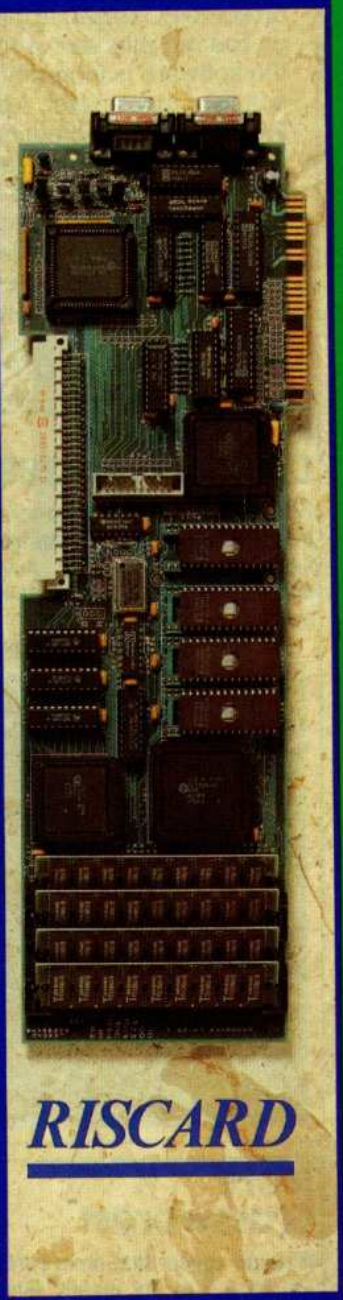
Computer Concepts – the company best known for their innovative range of software and firmware packages for the BBC Micro, have developed their own PC based DTP package called Equinox.

But to call it just a DTP system is like calling a house a box made out of bricks – for CC have combined the word processor, the FAX machine, the photocopier, the document scanner and the Laserprinter into one bundle.

CC's aim has been to centralise all of the hardware and software into three neat little boxes – the Flatbed Scanner, the PC and the Laserprinter. The rest is done either in software, or as hardware with their Equinox processor board which, suprise suprise, is a 32 bit RISC based computer, 4 Mb of RAM and a FAX software interface for the PC's I/O port.

The board (photographed on the floor of their local lavatory – so I was told half jokingly by a man on their stand at the latest PC show at Earls Court – it's plausible) will fit into any Personal Computer (so they say), and it will cost a packet – 3700 for an Equinox system without a PC or document scanner, and *that* is bottom of the range!

The system will run under *Impulse*, CC's multi-tasking operating system, which is currently being ported across to the Archimedes (and other systems so I am reliably informed), and software houses are looking at porting across applications (written in C) to run on the new third party OS, although, if any of these are a success it remains to be seen and I will reserve judgement until I know more about the hardware and software *driving* the Equinox system.



Acorn Unveil DTP software

You will need the RiscOS ROMs fitted before you even start to think about using this package; but whereas many packages for other machines require lots of memory and plenty of disc swapping and access, this is a remarkably powerful package at a fraction of the price of similar machines.

Based on the popular package *TimeWorks* from Cambridge based GST – the authors of *First Word Plus*, the Acorn DTP package quite literally kicked a lot of asses in the printing industry (animal allusions intended).

The page can be pasted down anywhere on the screen, and text can then be laid down within that framework. It is a multi-page DTP package that can, like Alldus' *Pagemaker,* be used to flow text from one page onto another (it isn't as easy as you may imagine on some PC based applications I could mention).

The big plus about this ADTP – above the fact that the software is incredibly intuitive – is the fact that the software runs so fast. Apple Macs are being pushed to their limits when creating pages of text and graphics, whereas on the Archie, the processor is chugging away happily, and the only time it seemed to even have to think about what it was doing, was when it had to create Postscript™ files.

Of course, my impressions were based on only a day's worth of playing with the software, and I will be writing an in-depth account of my experiences on the DTP software at the DTP show.

Noo Spulling Chooker forr Z88

Z88 users can benifit from error free text with the new cartridge-based version for this most popular portable amongst Beeb owners.

This version has a starting vocabulary of 60,000 words *plus* the option to add even more with Z88 RAM packs.

SpellMaster for the Z88 costs 59.00 and as available from Computer Concepts Ltd at Gaddesden Place, Hemel Hempstead, Herts, HP2 6EX ☎ 0442 63933.

Archimedes Computers Networked in Italy

In accordance with Italy's national plan to introduce micros and computer studies into all secondary schools, the *Instituto Technico Statale Commerciale "Vincenzo Comi"* school for accountants have installed over 20,000 worth of Archimedes equipment with Econet and 20 Megabyte filestore. The networked Archimedes systems will be used to teach programming and networking techniques to students aged 14-18 years old.

This is quite a move for a country that has MS-DOS as a compulsory standard in all Italian schools, and teachers – once aware of the excellent emulation capabilities of the Archimedes – were more than happy to use Acorn's "golden boy" computer.

Archimedes Weapons Training

Hup Hup Hup Hup... HALT!

A classroom based mortar and artillary training system where a computer fires the shots was featured on the Acorn stand at the Milcom show – the military computer exhibition at Wembley.

WIFT, the *W*estland *I*ndirect *F*ire *T*rainer system has been developed by Westland System Assesment to simulate realistic battlefield conditions for gunnery and mortar training using the Archimedes.

Apparently this level of sophistication is gained by video projection, using data typed in by students using binoculars (*looking at a video projection*?) to calculate grid references whilst using the Archie to calculate the type of mortar. This information is used to correctly place the projectile whilst simulating the sound and images of a mortar wheeling it's way over the heads of your enemy and, hopefully, right on target (wherever that may be).

WIFT is just one of the computer based training systems developed at Yeovil on the Archimedes, and it made quite good use of samples and digitized pictures – traditionally ideal for this sort of application.

More Crosswords!

It would appear that crosswords are flavour of the month. Even Northern Micromedia have produced something for all you across and down buffs out there in Beebland.

Crossword Call-up **is a crossword generating program that allows puzzles to be created from a database of clues which are linked to subjects and levels. It is pitched at the schools market, and is available on the BBC B and the Master for 9.00. Compact and and Arc discs are selling for 14.00.**

Also just released is a maths package for juniors called Funfair and a sequel to the **Pip goes the Moon** package entitled **Pip's Island Adventure.**

This will cost the Beeb and Master owner 15.00 whereas Compact owners can purchase it for 17. Contact Northern Micromedia, Resources Centre, Coach Lane Campus, Coach Lane, Newcastle upon Tyne NE7 7XA ☎ (091) 270 0424.

REPTON

INFINITY

FILMSTRIP
The Character Designer

REPTON 3
Skulls & Safes & Spirits

LANDSCAPE
The Screen Designer

REPTON 4
Can You Photocopy the Ghost?

BLUEPRINT
The Game Creator

ROBBO
Exterminate the Space-Fish!

FILELINK
The Co-ordinator

TRAKKER
Chased by a Jagga

REPTON INFINITY — Featuring a Sophisticated Game Creator

The Repton series of games is the most successful set of software ever published for the BBC Micro and Electron computers; more than 120,000 Repton cassettes and discs have now been sold. Repton has been aptly described as "the thinking man's arcade game" . . . since it requires the use of clever strategy as well as pure arcade-skill.

Repton Infinity is the ultimate Repton program. You can completely redesign all of the game characters and game screens. But more than this, you can now also create a wide range of diversely different games by using a special game-creating language.

The 4 games provided (and illustrated above) give some indication of the versatility of this package:

- Repton 3 – to show you the way.
- Repton 4 – a new puzzling predicament for our hero.
- Robbo – a crazy robot in a strange topsy-turvy world.
- Trakker – with 4 animated opponents to petrify you.

Let your imagination run riot as you devise new games. Select your own sound effects and visual effects. Decide how many opponents you wish to have. Perhaps include a river inhabited by piranha-fish or a battlefield with daring commandos. Maybe design a timid adversary who runs away from you. How about some friendly creatures who will help you in some way?

You control the behaviour of the creatures . . . You determine the rules of the game . . . You create the whole scenario!

Each copy of Repton Infinity includes:

- a comprehensive manual,
- FILMSTRIP – the Character Designer,
- LANDSCAPE – the Screen Designer,
- BLUEPRINT – the Game Creator,
- FILE LINK – the Co-ordinator,
- the Repton 3 game – with 8 game screens,
- the Repton 4 game – with 8 game screens,
- the Robbo game – with 8 games screens,
- the Trakker game – with 8 game screens

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(The screen pictures show the BBC Micro version of the game.)

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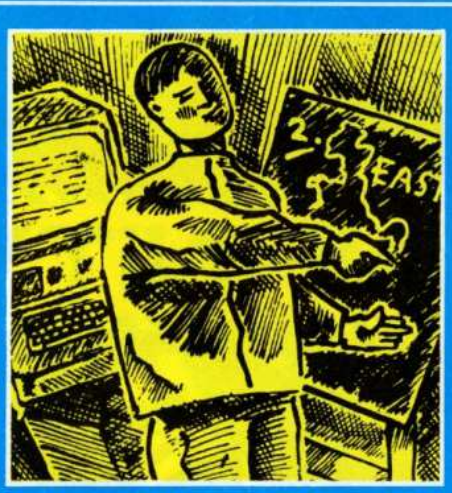
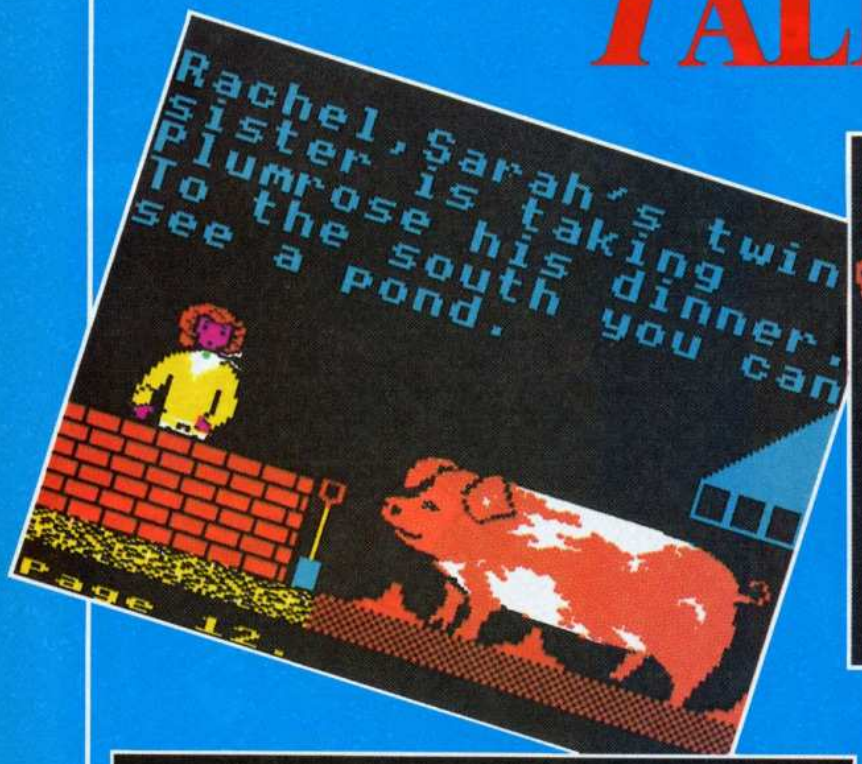
Des Thomas

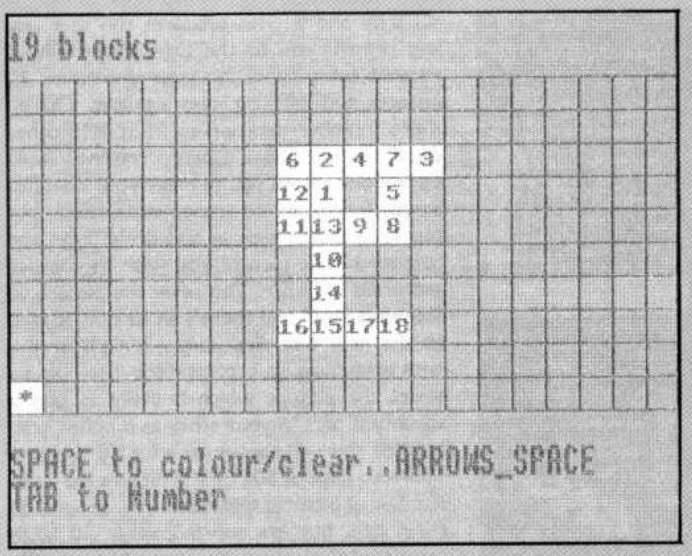
Telling tales out of school – and just in time for Christmas!

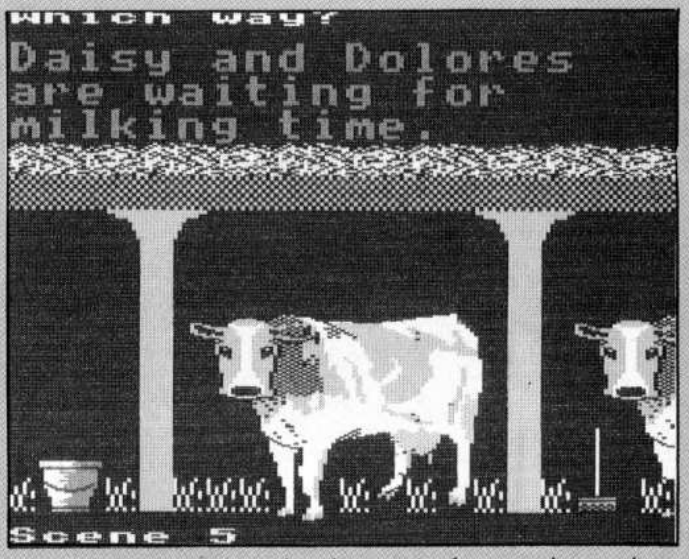


If you've ever listened to a story told by one of the well-known storytellers – the late Kenneth Williams immediately comes to mind – you'll realise that it is an art. However, just like comedians, singers or musicians, they need good material in order to show off their ability to the full. If you are good at making-up and telling stories and put your talents to full use with your children, then probably you're doing more than you realise in helping to develop their language skills. Unfortunately for a large number of children, those skills are not equally spread around, and many of us require stimulii of some sort to get us going. Even then those glorious words that some can use to paint

TELLING TALES







marvellous pictures don't flow too easily!

1988 has seen the publication of a fine range of desk-top story programs which will make excellent Christmas presents, they will help all the family's creative talents and make a pleasant change from all those arcade games (apologies to Dave Reeder)!

The Tales/Lands Family

In the April edition I reviewed *Fairy Tales* from RESOURCE, considering it mainly from the point of using it in the classroom. Shortly after writing that I received copies of *Old MacDonald's Farm, Fairy Lands* and *Farm Lands* which were mentioned in the article – and in playing around with these I soon recognised the marvellous opportunties these offer to the home computer user with children. Although they were designed to be used by children from infants up, to my mind they have a treble purpose.

Firstly, the youngsters can use the graphics to provide themes for their own stories – don't forget, they're likely to have far more time available to them on the home computer than they'll get in school! Secondly, Mums, Dads, Grandmas, etc, etc, can use them to create stories for the younger members of the family – and friends, of course; and, thirdly – could be the most productive if used well – the "oldies" working alongside the youngsters in creating stories. Not only will these make wonderful bedtime reading – yes, you will have to hold the sessions around the VDU unless you have a printer! – but I'm sure junior will be thrilled to take a copy, be it electronic or hard-copy, into school to add to the library. Who knows, it could be the start of a promising new and profitable career – early retirement at 35!

In that review I suggested that there should be versions using the characters from *Dust* and *Droom* – those delightful adventures also from the keyboard of Derek Allen – and a *DIY Tales*. Well, they can certainly pull the stops out at RESOURCE when they try (no doubt they were already under preparation!), because by the time you read this not only will there be *Droom Tales/Lands, Dust Tales/Lands, Desk Top Stories* (Archimedes only), but also *Christmas Tales/Lands. Roman Tales/Lands (linked with a new history pack on the Romans, Isca,* by David Ellingham, who was responsible for RESOURCE's *Castle Pack)* is in preparation, and I'll come back to DIY Tales. BBC Software has joined in the fun as well and has commissioned Derek to produce a version called *Ramayana Tales/Lands* to link up with their TV series, I'll be watching out for it.

The Tales Family

For those of you who don't know about *Fairy Tales* let me give you a brief synopsis of the tales programs. (For a fuller account, please refer to the April edition pp 56-58). The basis of each is a library of pictures, the number varying somewhat from program to program, which can be used to illustrate a "book" of up to 40 pages (*Dust Tales* 20 pages) – each page being a screen. A page may contain a maximum of eleven pictures from the library which may be placed anywhere on the page. A few of the larger pictures are composites, ie made up of two or more pictures. Double height text can be added to the page in any colour, but by a simple touch on the TAB key the lower case keys produce a special graphic character set, which can be used to enhance the picture. I don't think that there is such a thing as a "typical page", but fig.1 (taken from *Old MacDonald's Farm)* shows most of the features mentioned above.

I don't propose to go into great detail about the individual programs. *Old MacDonald's Farm* and *Christmas Tales* are fairly obvious from their titles and, as I mentioned earlier, *Droom Tales* and *Dust Tales* are derived from RESOURCE's well-known adventures. The first is based around a story in which a princess has been kidnapped by the wicked dragon and the prince has been turned into a frog. The children have to rescue the princess. *Dust* is a sequel, but has a space flavour. *Roman Tales/Lands* will be slightly different, having a Romanesque font instead of the double height type. The characters in *Ramayana Tales* are based on Hindu mythology, a subject with which I'm not very familiar, so I'll be viewing the Watch programmes on TV! Hopefully, if the Editor is feeling generous, he'll allow me to use a couple of screens from all the programs to display some of the characters – this is likely to whet the appetite far more than any long description.

The Lands Programs

The Lands programs I can best describe as simple adventure generators. The pictures on *Farmlands,* for example, are exactly the same as *Old MacDonald's Farm* and the pages are created in the same way as the Tales programs. However, instead of moving from page to page as in a story, you have to move according to the cardinal points of the compass. The adventure is set up on a screen map (fig.5), where a screen is linked to one of the squares on the grid. Of course, if you prefer text only adventures, you can forget the graphics, but I can't see many doing that! I must admit I've seen very little use of adventure generators in schools despite the fact that we're told that they are one of the framework programs that have so much to offer. Unfortunately, generally speaking, they are very time-consuming, but the Lands programs offer an excellent introduction to the concept.

Printing Stories

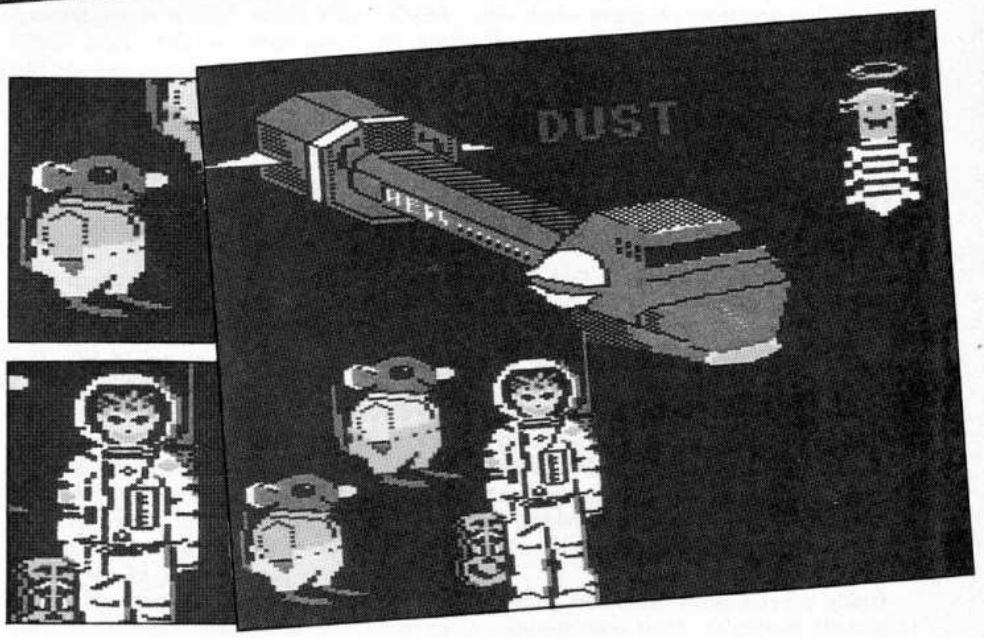
I mentioned earlier that it is possible to print out the pages. All the programs are on floppy discs. The BBC's *Ramayana* programs are both on one disc with only an Epson dump, while RESOURCE's programs incorporate one on the first side and an Integrex dump on the other, while with the Master Compact disc the option is offered on startup. The latter will be a bit of a luxury for most home users, but it really does justice to the program. The nice thing about the colour dump – besides the fact that it is colour – is that you can change any of the colours before printing the screen. Apologies to any reader who wrote to MAPE asking for details of the colour dump, which I said was to be made available through them (Telling Tales – April 88). This dump is included on 4Mation's *Snatch* (See August's edition).

Fairy Tales Publishing Company

My leg-pull on the folk at RESOURCE in suggesting that they should be renamed the Fairy Tales Publishing Company has rebounded

on me, for that's the title given to their DIY Tales package. There's also a Lands version, *Fairy Lands Publishing Co.* Let's assume for a moment that you've bought a couple of the Tales (or Lands) programs. You can bet your life that before long little Susan, Johnny or Grandma is going to insist that the Wizard from *Fairy Tales* is essential to the story based on the characters in *Old MacDonald's Farm.* Probably they're thinking of turning the young MacDonald into the pig or something equally nasty! Well, this is where FTPC comes in. This allows you to make your own library of pictures from any of the Tales programs, so you'll be able to make up almost endless combinations. As it makes use of Sideways RAM, it can be used only on a Master or Compact. Once the disc has been compiled, however, it can be used on a normal Model B.

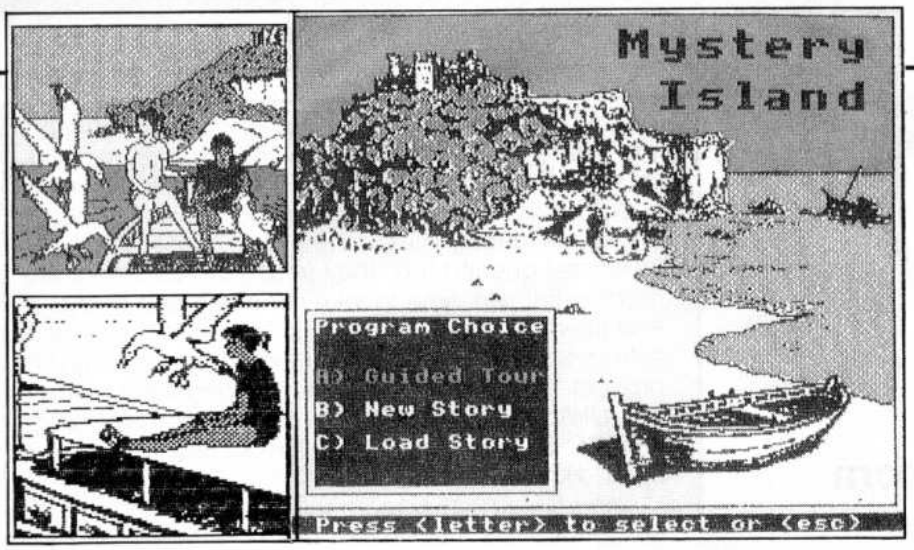
To create a new disc is a very straightforward exercise, so that children of upper junior age reasonably experienced in disc swapping should have little difficulty in creating their own working disc from the libraries available. Load the disc, replace it with a blank formatted disc and press <Ctrl> and R. This prepares the new disc and returns you to the title screen with a request for a name for your disc (max. 12 letters) and offering two options. Option three (number retained to fit in with other discs!) is the Show Library routine, while option one allows you to make your own file. Simply follow the on screen instructions: put the first source disc in the drive, type the number of the picture you wish to transfer and press <TAB>. This saves the picture to Sideways RAM and there's an automatic save to the new disc after every ten pictures – with a warning to change discs first! Try to select the picture which is likely to play a significant part in your story as number one, because this will appear on your title screen. There's a limit of 50k on the picture file – the number of pictures will, obviously, depend on their size, but it's approximately 50 large "single grid" pictures. You can add to the file at any time up to this limit.



If you've purchased either the Tales or Lands versions of all six packs, you'll have a library of something around 250 pictures – so far! Number's not everything, of course. A couple of teachers who've used *Fairy Tales* said that they thought the children were spoilt for choice and tried to cram in too many characters into their stories just because they were there – can't win can you! Well, if your little darlings are guilty of that sort of thing, here's your chance to give them a lesson in selectivity, because you, or they, can add as few pictures as you like to the new file.

So, you've made your new file of pictures and are rearing to go. Pressing <Ctrl> and L from the front screen causes the disc to behave as a normal *Fairy Tales/Lands* disc, with the three options as normal, and away you go.

I had hoped that Derek Allen would have included a facility whereby you could incorporate characters from other MODE 2 programs, edit some of the existing pictures or create your own, but at the time of writing that's not going to happen – unfortunately! How many would use such options I'm not sure, but they'd extend the use of the program. Of course neither school nor home can



afford to purchase endless programs of the same type, however good they are, so it would be a pleasing gesture on RESOURCE's part if they included an option which allows any Tales/Lands picture file to be loaded in, and in future gave the purchaser the option of buying the whole program – assuming there are going to be more! – or just the picture file. Those programs not required could be wiped off the working discs quite easily so that story space is not taken up! However, let's not end this part on a critical note, for *Fairy Tales/Lands Publishing Co* are very useful programs, which will prove invaluable to all users of the Tales/Lands programs, making them even more versatile than they already are.

Desktop Stories

If you've traded in your Model B or Master for an Archimedes, to-date your youngsters are probably feeling just a little peeved about the lack of software for them. Besides any arcade games – I expect you've guessed they don't appeal to me! – there's the super version of *Droom* (Super Droom – must be a good title for a sequel!), HS Software have transferred their reading programs (without enhancement), and Clare's excellent *Artisan*, which is sufficiently user friendly to enable children of upper junior age to cope. That's about it to the best of my knowledge – I must admit I haven't tried using the emulator.

Derek Allen and RESOURCE have come up trumps once again, and in *Desktop Stories*, they have produced a Fairy Tales type program for the Archimedes. It has all the features of the original program plus many additional facilities that one might expect from the vastly more powerful machine: greatly enhanced graphics, speed, larger picture library, and picture editing to name but a few.

Desktop Stories is supplied on two discs: the story disc and a library disc. The latter contains a library of pictures from which you can select a subset to make up a picture file for your story disc. It also contains utilities for editing and extending your picture file, for setting up a story disc prior to the creation of a new story and a utility which allows you to create your own pictures for integration into stories. The handbook gives a very helpful guided tour of both discs – follow it carefully and you'll soon get the hang of the program. It's even easier, of course, if you've already used one of the Tales/Lands programs!

The screen display on the story disc is divided into three windows: the top one contains the menus – DTS is controlled from a series of menus by a simple click on one of the mouse's keys; the "page"; and at the bottom an information window. The Story disc supplied already has three picture files which have been created from the library, and these have been used to create the demo pages. Once you've seen these – and like me probably quite amazed and excited at the quality – it's as well to use these files to create a few pages before trying to make your own files. So, select a blank page and the file of pictures you wish to use and away you go. Unlike the Tales programs, you're not limited to just eleven pictures. If you've got the time and the inclination, you can add up to 200 pictures per page!

Add to this what you can create by using the second set of picture characters available, as in the Tales programs, via the lower case letter keys (backgrounds, walls, block lettering, etc, etc), and the double height text, both of which are available in 256 colours, and the expression "the results are limited only by your imagination" really is most appropriate.

The pictures are selected from the file – list displayed in centre of screen and clicking up and down takes you through the list. The chosen picture appears encased in a box and this can be moved to any position on the screen using the mouse. Additional features at this stage include *Repeat* and *Reflect* options, and as the handbook suggests it's best to work from the back of your picture forwards since the most recent pictures are superimposed on earlier ones. This is an improvement on the Tales programs, but one reversal I don't think I find as helpful is that you can create a picture over text, but not vice versa. The *Change* option gives some quite powerful editing facilities, including a *Tidy* option, which plugs any nasty holes left in the background when a picture is deleted, be that pictures, text or block graphics.

The next big step is to create a new story disc. Having made a back-up copy, you set about creating your picture file from the Library disc, and again this is quite a straightforward process and similar to selecting pictures for the screen – list of picture names down the left hand side of screen; box displaying chosen picture on right hand side. The highest number of pictures you may have on a file is 100, again, depending on their size. Someone who's read this article carefully so far is no doubt questioning my statement that you can have up to 200 pictures on one screen but, of course, this would involve some multiple use of some of the icons, eg mountains, waves, flowers, people and so on...

The last option available in this section is a facility which enables the more creative among you to make your own pictures. The picture editor works in the same way as the sprite editor on the Archimedes *Welcome Disc*. The draft documentation I've been using for DTS refers the user to the Archimedes *User Guide*, so unless you're one of those who enjoys the challenge of such documents or RESOURCE relents and includes a guide "by numbers", this is likely to be the most time-consuming part to get to know.

Now you have your new story disc which you can use to create your own illustrated stories as described earlier. There are two major options which I haven't mentioned so far. Firstly, it is possible to save a screen for manipulation and printing using Clare's *Artisan* and the Artisan *Support Disc One* includes some excellent printer options – or printout using DTS's own printer dump. Both operations involve converting the screen from MODE13 to MODE12, which gives a more limited palette, of course.

If, like me, you find the Tales and Lands programs delightful, you'll be enamoured by *Desktop Stories*. It has the sophistication of a professional program combined with the simplicity of operation necessary for young children. Well worth waiting for!

Mystery Island

Mystery Island is the latest package from Tressell Publications, the teachers' co-operative well-known for its excellent historical simulations. It's a creative writing program – incorporating a picture editor, text editor, word processor and spelling checker. It is intended for children in the nine to twelve age group, although I feel sure that many seven to eight year olds will cope with the picture and text editors very effectively.

The software is supplied on two discs. The first is the start-up disc – seems to be a favoured method of protection these days! – which also includes the wordprocessor and the spelling checker, while the second contains the story editor (picture and text editor). A 40 track Story disc holds only one story file, while an 80 track version will hold eight files. Files may be stored on blank discs or the story editor disc may be copied.

Having loaded the startup disc, selected the first option and swapped discs, you're given a further three options: a guided tour, a new story, or a load story. The first gives a brief but successful introduction, so that the *mechanics* are very straightforward. Unlike the Tales family, the working screen is divided into two parts, so that the picture and text are kept separate, and the text is displayed at normal height. So, when you select the second option, and follow the menus, it's child's play – providing you remember you can't review or revise a story until you've written one!

Choose "Create Page" in the story editor menu and a list of eight scenes appear. You'll have come across them before in the guided tour, and a copy of the pictures is also available in the notes. Your chosen scene appears in the top half of the screen, while the bottom half gives the option of going to the picture or text editor. I imagine most users will prefer to create the picture, or even the series of pictures, then write about it.

The picture editor has eight groups of "transfers": boys & girls, creatures and objects, and you can select up to eight to be added to a scene. A nice touch is the option to change the direction of the transfer and/or change the colour of the children's skin and/or T-shirts.

The text editor is also rather pleasing, offering useful word processing facilities which make good use of the function keys, and the text scrolls allowing up to 30 lines of 40 characters per picture. The spelling checker allows you to check your spelling when you are entering text or revising it later. The revision option allows you to add/delete transfers and improve your text – I like using the word "improve" as it has a more positive feel about it than "correct"!

The third option in the story editor enables you to review your story – just look through what you've done so far – and print it out. The printout can be made on an Epson compatible printer or Integrex/Canon colour printers. It produces a very neat affair with borders around the "page", which gives a very finished effect.

Hopefully most schools will already have their wordprocessors, which give some progression to the skills which children need to develop, so it may be in those circumstances that this section will have relatively little use – although any reasonably experienced user of any introductory system will find little difficulty in getting to know this one. In the home situation, however, if your youngsters are not ready for whatever full-blown system you have, this section could provide a useful bonus. It works on the same basis as the text editor.

It allows text to be loaded/saved, compacted, centred, sections to be copied/deleted, printed and, of course the spelling checker can be used. This has a built-in dictionary of 22,000 words and gives the option of adding up to 1000 of your own – not a bad bonus program! The present system runs from disc, which means it is rather slow (about six minutes for an A4 page). They are hoping to develop a sideways RAM version to speed things up. If they do, they ought to link it to the other educational wordprocessors.

I must admit that, while I'm really taken with *Mystery Island*, in the home situation you might have to "do the theme to death" in order to get your money's worth, so perhaps it is better placed in the school situation for which it is designed, where it can be used by numerous children for as long as the Model B/Master computers are around. However, Alister Pike, the author, tells me that there are already a couple more creative writing themes in the pipeline and the starter disc will be the same for all so all you'll need to purchase for future titles will be the story disc, at around half price. Good thinking! That immediately makes it more of a viable proposition for both home and school, and he too is thinking of a program which will enable you to compile your own combination of pictures and transfers.

In an Edsoft Special on Tressell Publications (March 88), I said that I hoped we'd see some of their quality programs for the younger age groups – they've made a very good start with *Mystery Island* and it is already selling well!

Conclusions

If a certain educational computing magazine still produced its Top 20 programs, I feel sure that these would come high on the list for 1988. I hope you and your family have as much enjoyment from them as I have and, if they start off an interest in story telling/writing, they'll be one of the best presents you could give. Happy creating!

Factfile

Fairy Tales, Old MacDonald's Farm, Droom Tales, Dust Tales, Christmas Tales, Roman Tales; Fairy Lands, Farm Lands, Dust Lands, Droom Lands, Christmas Lands, Roman Lands £14.95. Each pack contains a voucher which enables you to purchase the corresponding Tales/Land pack at £10.95.

● Fairy Tales Publishing Company, Fairy Lands Publishing Company £9.95 Desk Top Stories £29.95 RESOURCE, Exeter Road, off Coventry Grove, Doncaster DN2 4PY. ☎ (0302) 63800.

Ramayana Tales/Lands £14.95 BBC Soft, Woodlands, 82 Wood Lane, London W12 ☎ 01 576 2547.

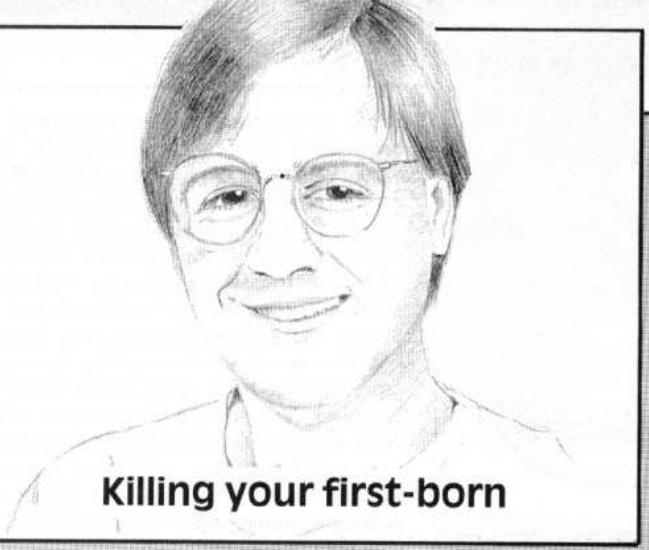
Mystery Island £20.00 Tressell Publications, Lower Ground Floor, 70 Grand Parade, Brighton ☎ (0273) 600186

● Please note that all prices exclude VAT.

Illustrations

1. **Scenes from Old MacDonald's Farm showing pictures from library, graphic characters and text.**
2. **Pictures from the library of Ramayana Tales.**
3. **Droom Tales.**
4. **Dust Tales.**
5. **Map grid to generate the adventures in the Lands programs.**
6. **Scene from Farmlands.**
7. **Scene from Christmas Lands.**
8. **"Mix-n-matching" pictures using Fairy Tales Publishing Co.**
9. **Desktop Stories. Photographs to be taken from disc – to be sent as soon as possible.**
10. **Screen dumps and printout from Mystery Island.**

Comment



Killing your first-born

I think one of the most important things about the PC show this year was the fact that there was a refreshing wind of change blowing through the crushed halls and heated hallways of Earls Court, there were an amazing array of new(ish) machines, all with their different operating systems, incompatible disc drives, alternative software choices and, perhaps more importantly, there seemed to be more interest about the products on display, although Sinclair (*nee* Amstrad) very kindly gave us a few laughs with their PC-200.

True, there were a hell of a lot of PC compatibles on the stands, but there were decidedly less than on show than last year (being a positive desert of incongruous grey boxes), there were virtually no Beebs on show and even fewer Archimedes machines then, but this year there were no less than *three* large "Acorn" stands (and I don't mean the barrow boy stalls on the periphery of the central hall). There were Archimedes computers on show at Acorn's reputed £½ million stand – not to mention £30,000's worth of tackle.

AB marketing under the name of AB *First* (their use of italics not mine) were there, and Hugh Symmons – Acorn's "prodigal son" distributor were also on show – welcome back.

The fact was that for many people, the Archimedes stole the show – not in terms of sheer quantity (as the weekend was swamped by little boys running about and being sick in the games area), but by the sheer *quality* of the products on show; when people walked onto the Acorn stand, they forgot all about the PCs of the world, they forgot all about the standardization and gutless "follow the leader" attitude (see last month's Comment), what they saw was a beautiful machine running effortlessly and with the new RISCOS connected to the latest batch of Archies, the Amiga had some very serious competition as the Acorn window and multi-tasking environment quite frankly beat the hell out Commodore's sluggish "Workbench" on the Amiga.

But where were the Beebs? You know, the Model B and the Master series that so many of us still use? Acorn were rather uncomfortable when I put forward the question, and they refused to comment on their position with their support of the BBC Master let alone the BBC B, all I got was the following:

"Oh, we are still producing Masters" one Acorn man told me, "It's not as if we have completely dropped the machine in favour of the Archimedes"

Another gentleman on the stand told me, "The BBC Master is still being produced", "*I* would call that support, wouldn't you?"

Quite frankly, I wouldn't, producing 40,000 Masters on "special order" isn't really supporting a machine, there was no software or hardware on show for the Beeb B and the Archimedes computers outnumbered the Beebs roughly fifteen to one.

When I queried this, they refused to comment any more and it was time to take my place and enjoy the Archimedes show – Mike Beecher, bless his little cotton socks, had a Beeb next to his Soundsynth product, and a lonely little beeb talking via a modem was all Acorn had to show the world what they had for the BBC B- there wasn't even the old Econet setup we used to know and crash.

The point is that if Acorn refuse to support the BBC B and Master series, where does that leave us? I will say now that I am a true blue Beeb owner, okay so I love (and use) the Archimedes, a significant proportion of A&B's readership now own Archimedes computers, and we reflect this by allocating a specific proportion of Archie articles in the magazine, but *I will not let the memory of the BBC B die*, it is still one of the finest computers ever made, and if they (Acorn) have left it up to people like you and me to keep it alive, then so be it.

The presence of a Beeb Public Domain library has helped matters no end, but still the fact remains that three out of every five press releases and news items relevant to this magazine are for the Arc; we cover whatever new BBC B and Master series products as soon as they are ready, but at the moment the Archimedes is the golden boy, so it (quite rightfully) has most – but not all of the limelight.

So Acorn, please remember this and don't just play lip service to all us BBC B owners out there, we know that the Archimedes is the way ahead as far as your corporate image is concerned, and you are pitching the Archimedes at an entirely new type of user (ie, not the home hackers), and you have earned the reputation you deserve for building high quality computer systems, but don't ever forget the people who put you there – all the hundreds of thousands of BBC B owners that are *still* using your machines, your languages, your hardware products and playing your games.

You may forget that for some people, the Archimedes is just too powerful to be a serious upgrade, that for some people all that they need is a decent wordprocessor, a spreadsheet, some games and a friendly programming environment and that the Archimedes would be a sorry waste of a machine.

If people upgrade from their BBC Bs and Masters to an Arc, then the chances are that they will hold on to their Beebs, such is their dedication to the humble 32K machine. For many people, the Beeb opened the doors to a fascinating new world, it is like an old friend – certainly not some "thing" to be scrapped in favour of a new machine, no matter how powerful it is!

My message to Acorn is don't forget that you have *two* of the finest micros ever made, not just one. If you forget this, then you may lose that loyalty, you may lose a vital part of something Acorn always stood for, something "corporate images" can all so easily erode. Don't abandon your Quixotic, but none the less honorable search for powerful computer systems and showing the world that Cambridge can really take on the world.

Don't forget what I have said Acorn, and don't kill your first born.

Dave Reeder

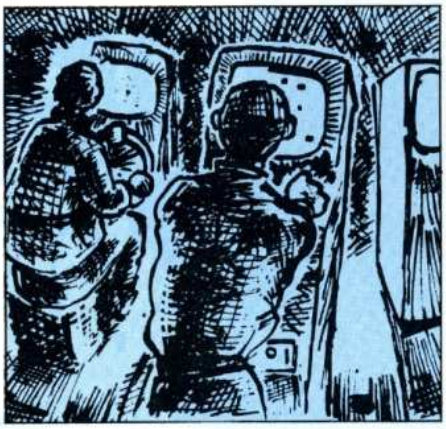
Welcome!

Good news and bad news this month, I'm afraid. The good news is that the software houses dedicated to the Beeb market seem to be pulling out a few stops for Christmas trade; the bad news is that there is rather fewer of them than last year.

Still, that does allow us to linger at some length over previews, over hot news and over some cracking new games. There should certainly be enough of major interest for the next four months to keep us hovering over our keyboards and if even half the rumours I hear about games under development are true then we'll have a great '89. What games? Sorry, all off the record at present. (you'll just have to keep on buying the mag won't you – Ed).

And if you are uncharitable enough to think that there are an awful lot of Superior games this month, then just be thankful for Hanson's commitment to the machine we love.

So, on with the goodies.

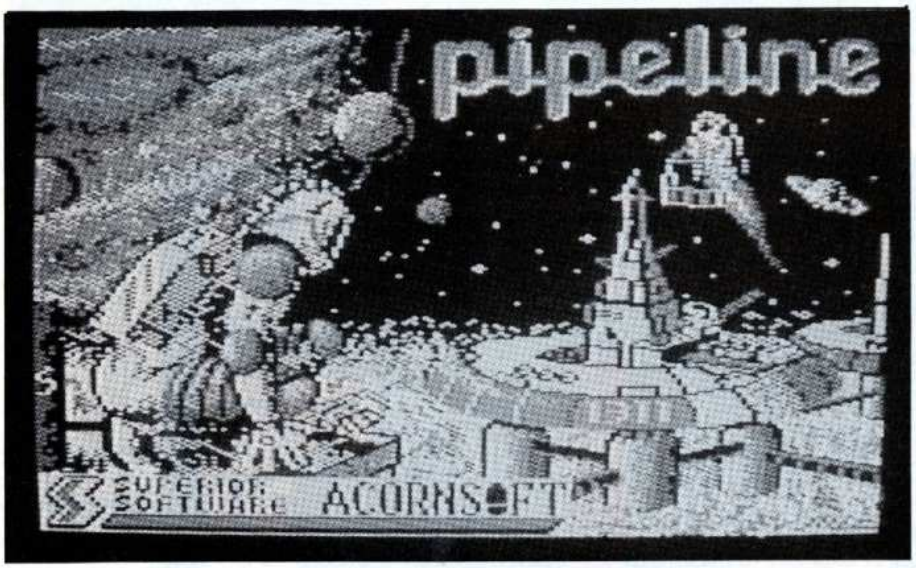


Hooray! The Arcade's Day has come! Loadsapages... loadsareviews... loadsafun!

THE ARCADE

Game of the month

Pipeline **Superior Software / Acornsoft**
Model B/B+/Master/Electron Tape/disk
£9.95/£11.95/£14.95
Graphics/sound 8 Playability 8 Originality 8
Options – Value for money 8 Lifespan 7 Overall 8



Readers with long memories will recall The Arcade's preview of this much earlier in the year – now the game seems to have changed dramatically for the better. I loved it then, now it's more than fun – it's complex, it's involving, it's a game of the month.

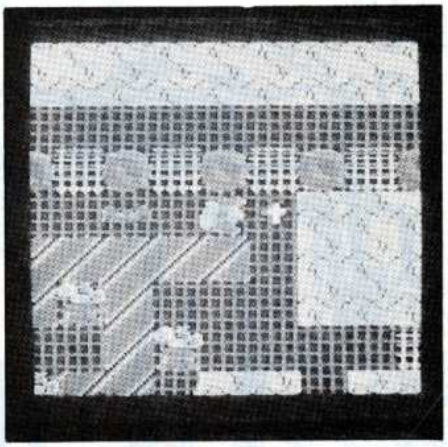
First, the boring background stuff. You should have seen this some months back but at that time the game was set on an oil rig and the hero Red O'Hare had to put out major fires. Fate struck, the day the artwork was printed up there was a disaster at Piper Alpha and so we now have a new storyline as well as improved graphics.

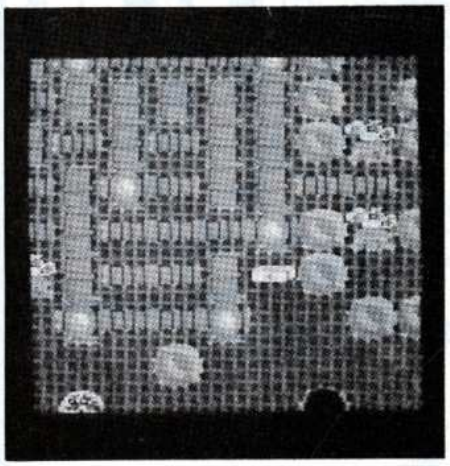
The game is now set on Io, a sulphur-covered volcanic moon of Jupiter – your mission (should you decide to accept it) involves collecting drums of suplhur from the large playing area. Unusually, for an arcade adventure, there is nothing to kill, just rather sweet moving flames and other evils to avoid.

The game has much of the same feel as *Ravenskull* - though that's no criticism of new coders Ian Holmes and William Reeve – partly due to the overhead perspective, partly due to the blocky graphics and partly due to the puzzles that have to be solved before you can reach some areas of each platform level. The game's main distinctive feature is the inclusion of pipes which carry you speedily from screen to screen – sometimes that's god, sometimes bad, especially as there is no way to turn halfway towards destruction.

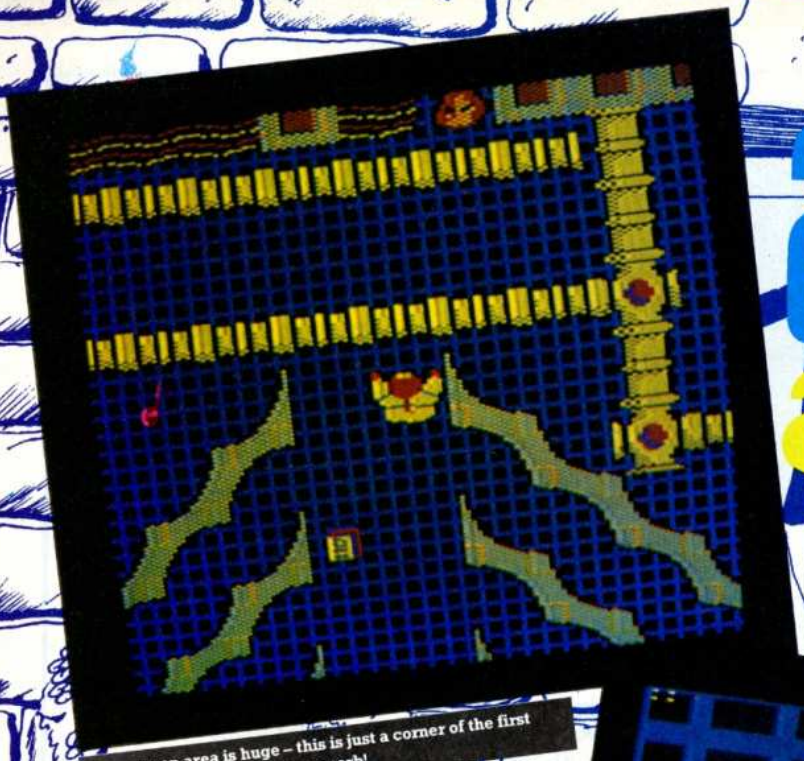
I really like this game – it is unusual but at the same time has a very familiar feel, like an old friend already. And the inclusion of an excellent and very powerful menu-driven editor which allows you to design new graphics, new screens and new missions. In fact, Superior are hoping to market the best of users' own designs.

After a couple of disappointing releases from Superior, this marks a return to top quality, top value entertainment. An instant classic, I reckon.





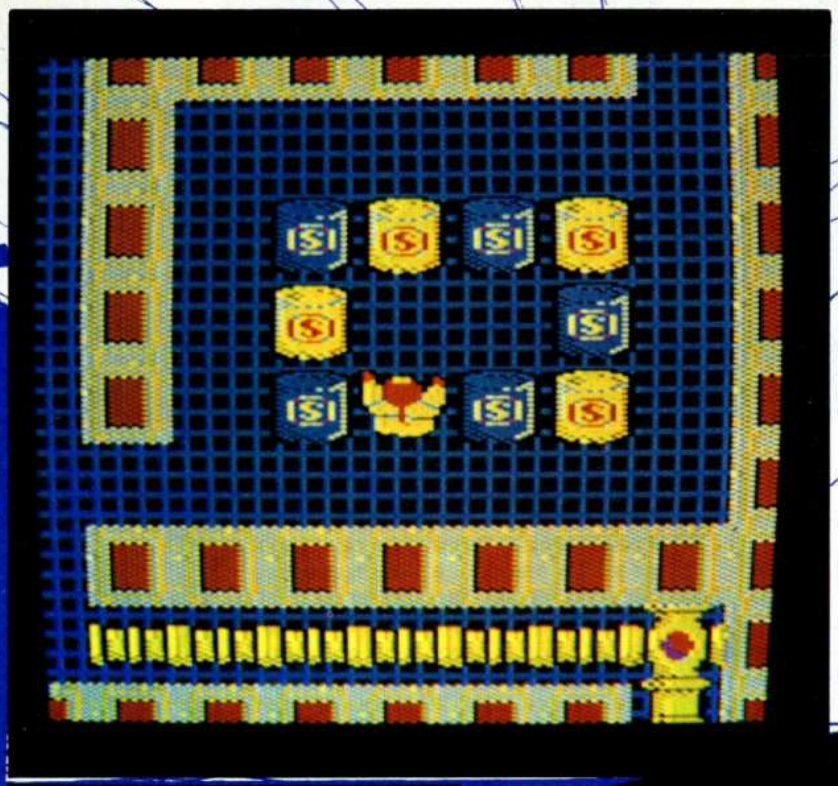
arcade alley



The screen area is huge – this is just a corner of the first level – screen animation is superb!

Designing a character in Pipeline's screen/character program – and not a Repton logo in sight!

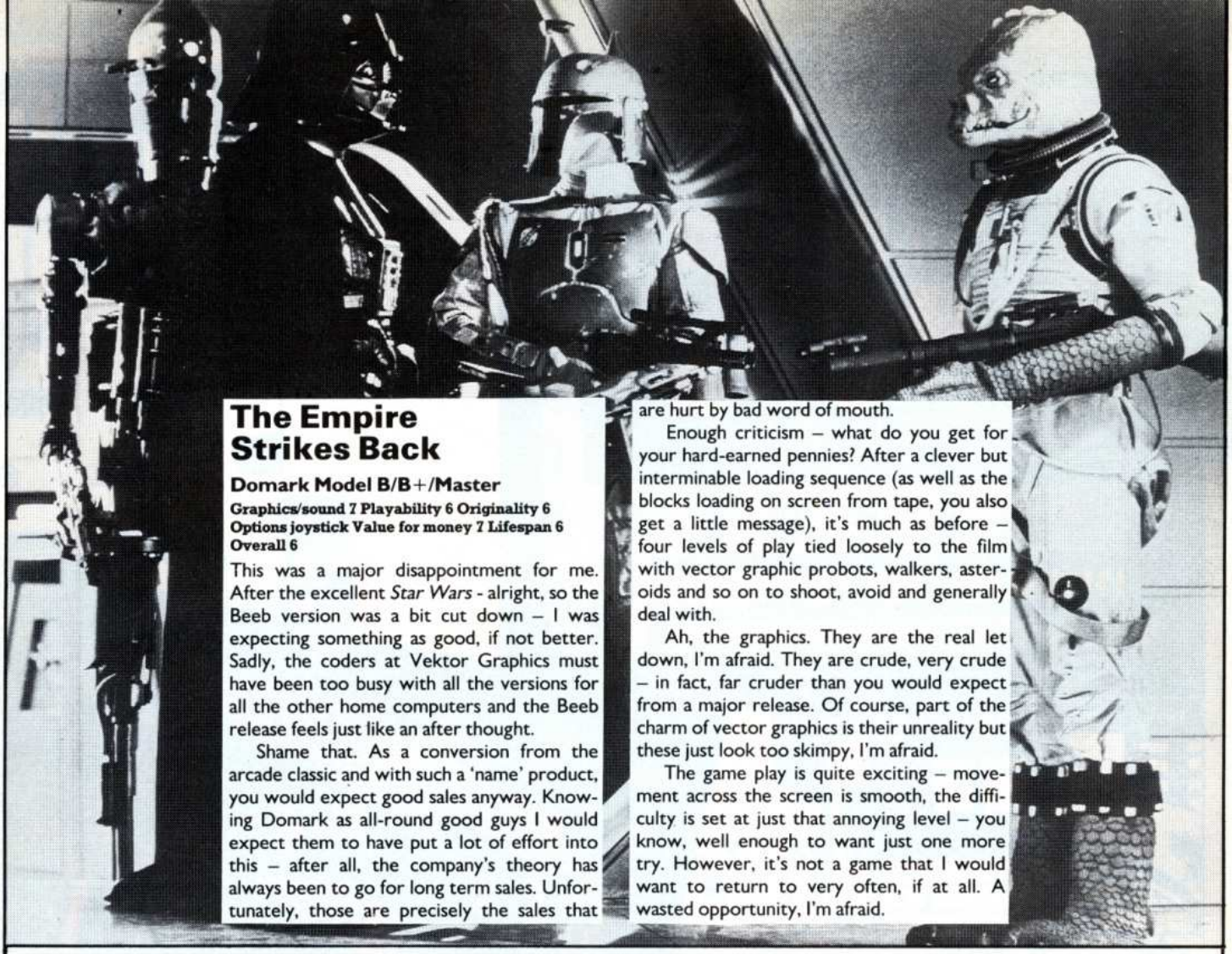
Infinity – spread out over a Mode 5 screen, the Superior Software copyright was "put on whilst they were assessing it". Look out for our special review and offer in next month's A&B.



Pipeline: Early on and there are drums to be collected.

Exile – beautiful programming and a real work of art.

Cosmic Camoflage – lost somewhere in the vaults of Superior no doubt, thank God they get this one out onto the streets eh?



The Empire Strikes Back

Domark Model B/B+/Master

Graphics/sound 7 Playability 6 Originality 6 Options joystick Value for money 7 Lifespan 6 Overall 6

This was a major disappointment for me. After the excellent *Star Wars* - alright, so the Beeb version was a bit cut down – I was expecting something as good, if not better. Sadly, the coders at Vektor Graphics must have been too busy with all the versions for all the other home computers and the Beeb release feels just like an after thought.

Shame that. As a conversion from the arcade classic and with such a 'name' product, you would expect good sales anyway. Knowing Domark as all-round good guys I would expect them to have put a lot of effort into this – after all, the company's theory has always been to go for long term sales. Unfortunately, those are precisely the sales that are hurt by bad word of mouth.

Enough criticism – what do you get for your hard-earned pennies? After a clever but interminable loading sequence (as well as the blocks loading on screen from tape, you also get a little message), it's much as before – four levels of play tied loosely to the film with vector graphic probots, walkers, asteroids and so on to shoot, avoid and generally deal with.

Ah, the graphics. They are the real let down, I'm afraid. They are crude, very crude – in fact, far cruder than you would expect from a major release. Of course, part of the charm of vector graphics is their unreality but these just look too skimpy, I'm afraid.

The game play is quite exciting – movement across the screen is smooth, the difficulty is set at just that annoying level – you know, well enough to want just one more try. However, it's not a game that I would want to return to very often, if at all. A wasted opportunity, I'm afraid.

Editorial Message

So there you have it ladies and gentlemen. So why the hell are we giving away prizes and posters with this issue, why not a glossy of *Pipeline* instead?

Er, fact is that we all loved playing this stupid game. A&B very nearly didn't reach you this month because we were playing it all the time – anyway, what the hell? *The Empire Strikes Back* is one of the best films there is ergo all the freebies and paraphinalia, vids, obviously we aren't going to change Dave's wording, that would screw up his journalistic impartiality and our editorial integrity, he didn't like it, but we did.

Sorry gang – it's up to you to decide

Cheat Corner

Cheat it again, Joe – Vols 1 & 2 Impact Software Model B / Master / Electron Tape/disk £2.99/£4.99

Graphics/sound – Playability 8 Originality 7 Options – Value for money 10 Lifespan 9 Overall 8

Now, here's the business! Each of these collections has 20 (count 'em – 20!) megacheats for all your favourite games – and at a very keen price too.

Impact you'll probably know as the ex-Superior Botterills who've brought a welcome breath of air into the Beeb/Elk mail order games world – lots of games, poster sized reproductions of Superior inlay artwork, loads of tips, etc etc.

Now this is the next logical step – instant help for all those amongst you stuck in your favourite games – too many to list but, for example, *Elite, Spycat, Codename: Droid, Ravenskull,* all the *Reptons* and many, many more.

And who do we have to thank for all these cheats? None other than The Arcade's own Mark Gidley which means that regular readers of this column will already have early versions of many of these cheats. And they're not all just infinite life pokes – imagine playing *Citadel* and being able to start with no keys required, no danger from monks and with the whole game speeded up. Loadsafun!

However, there is one criticism – despite Mark's best efforts – cheats work on both original versions of games plus the subtly altered compilation versions – it is not comprehensive enough. Not every game has cheats for both tape and disk – very annoying if you want the missing one!

Still, at these prices, you can't go wrong. These have to be cheeky little Christmas presents to yourselves...

Play it again, Sam 3

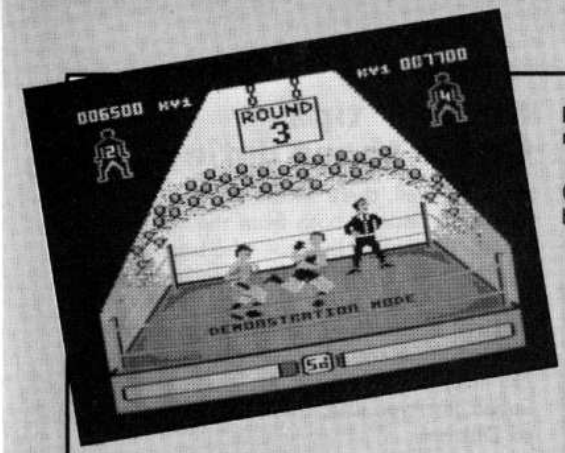
Superior/Acornsoft Model B/B+/Master/ Electron Tape/disk £9.95/£11.95/£14.95

Compilation Overall 7

Want to see a crowded loading screen? Then try this compilation's *Killer Gorilla* – Superior, Acornsoft and Micro Power logos all jostling for position. This is yet another of the excellent Superior releases with a 'best of the rest' addition of our lovable simian and Elite's *Commando.*

Though perhaps Micro Power's ape is only here to allow Superior to dust down its own Killer Gorilla 2 from the vaults? Anyway, there is a sense of overkill with the two reasonably similar games – guide your ape to the top of a set of ladders and platforms, rescue the girl, avoid the meanies, etc. Both are showing their age rather, but the sequel by Christopher Hyde is markedly superior (ouch!) in every respect – graphics, gameplay and so on.

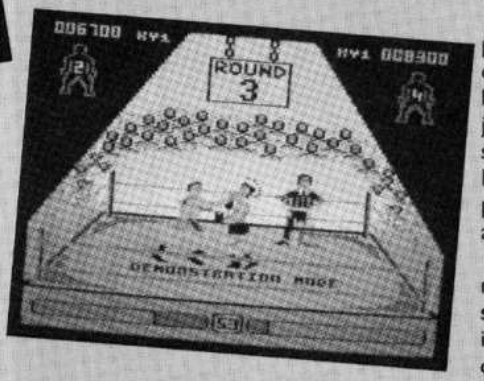
Still, worth checking out if you've no



Preview time

One Superior game that's been a long time in preparation is *By Fair Means Or Foul* - the boxing simulation. Now, at last, we get a sneak preview and it's fun but not stunning. It certainly doesn't blow Tynesoft's *The Big KO* out of the water as was suggested to me many months ago. In fact, it wasn't until I'd played the game for quite a while that I realised its strange gameplay.

Now that doesn't mean that I'm dumb (no comment – Ed) just that, unlike you buying a game and getting pages of instructions to read and digest, I quite often just get a disk with no inlay, no instructions and no help. It's sink or swim time, folks.



And the strange gameplay? Well, I guess in retrospect that it's obvious from the title – the idea is to cheat, to punch below the belt, to kick the opponent. Anything. Just as long as the referee isn't watching!

The graphics aren't outstanding, the gameplay a little tedious after the initial thrill of quietly kicking your opponent, rendering him harmless to the opposite sex, but that may just be a feature of the one player game. I suspect that two player cheating would be a lot of fun and may well be why Superior has persevered with this – for nearly two years, as I understand.

On the whole I'd prefer to suspend judgement until its proper release though I'm surprised it didn't end up on a compilation instead – especially when Superior is sitting on the astounding *Galaforce II...*

Preview time 2

This issue's second preview is a little strange, perhaps, because it's a compilation and all of you should know three of the four games concerned – *Frak!, Spellbinder* and *Grand Prix Construction Kit.*

A-ha, I hear you say – could this be Superior's *Play It Again, Sam 4?* Yes, it could though Elk owners will have to play Alligata's *Guardian* instead of the racing game which is Beeb only.

But – and this is tricky – is the hot news the inclusion of the legendary Orlando game, originally from Aardvark, or the fourth, as yet unmentioned, game? Well, let's stay with Orlando first. Anyone who's spent any time in the Beeb world knows his reputation (I've lost count of how many times I've told you that *Zalaga* is just about my all-time fave rave) so it's good to see Frak! back in the shops. If you've never seen it then you're in for a treat – the caveman who has to collect diamonds in a platform and ladders environment whilst bopping baddies with his yo-yo is one of the classic Beeb games.

So what is the extra game? Well, don't you want a quick sum-up of Spellbinder or Grand Prix Construction Set, both from Superior? No, neither do I. Good fun, solidly constructed games but neither ever really caught my imagination. What is interesting, however, is the fourth game here *Cosmic Camouflage.*

Never heard of it? Don't worry, it's new and, in keeping with Superior's policy of putting "games not quite worth full price" onto compilations, it makes this package very good value indeed. I can see Suprior's point, though – it's fun but not great, it's well-crafted but not stunning, it's ... *Meteors* brought up to date.

You remember the game, surely? A small spaceship centre screen, lots of meteors and other space junk closing in on you from all sides, just you, your trusty space cannon and judicial use of smart bombs, hyper jump and thrust between the next level and instant oblivion into a series of broken lines? Of course, you remember.

So too does "D.R.G." who coded this – David Griffiths? Surely not. There are differences, of course. The game is faster, smoother, has a good use of colour and so on but it does look, well, dated.

However, as a whole, the compilation keeps up the standard of the rest of the series – good value for money too.

sense of Beeb game history – these used to be state-of-the-art!

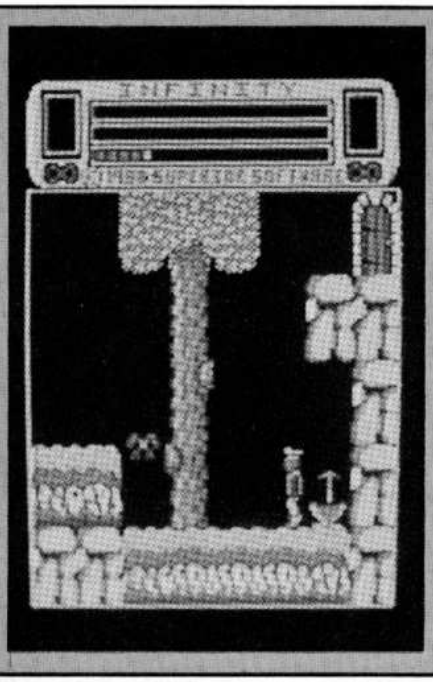
Commando is a reaonably competent conversion of the arcade smash, though suffering in retrospect from Tynesoft's clone *Saigon.* However, it is still compulsive and the desire to try to get your soldier up the screen past the enemy soldiers, throwing grenades and firing from the hip all the time is as strong as ever. Dreadful sprite collison, though!

The final offering comes as a bit of a surprise – Superior's *Palace of Magic.* Surely it can't be such a poor long term seller that it's condemned to the bargain bin already? I loved the game when it first came out – it's a sort of unofficial sequel to *Citadel,* another old favourite – and is well worth investigating if you're looking for a complex, well-crafted and visually appealing arcade adventure. Lots to explore, lots of puzzles, some great comic touches – a cracker.

Overall the compilation doesn't really hang together but it's a great way of picking up four interesting games. Check it out.

Hot Exclusive Scoop!

By Darrin Williamson



Once again A&B gets the games before anyone else, in this instant even before a supplier! Working title for the game is *Infinity* which comes from Dark Knight – a group of hard working lads who have spent about 18 months on this arcade adventure which sports some rather nice graphics, umpteen screens (all memory resident) and a choice of Mode 1 or Mode 5 resolution.

At time of going to press the guys from Dark Knight were in negotiations with Superior (as they have been for the last year). We demoed the game on our stand at the PC show and at our Open Day at Watford and it got a lot of favourable response. Here's a screen shot of the game to whet your appetite. Stay tuned for a full review next issue along with news of who's actually got the rights to the game. Back to you in the studio Dave...

Best of the year

Thanks Darrin. One of the brilliant ideas we had when preparing this bumber Arcade was to present you with a list of my favourite games of the year.

However, on reflection, that seems too easy – I'd just have to look back over a dozen copies of A&B and think for two seconds. No, what seems much more useful to me is *your* top games of the year plus, if you like, your nominations for stinkers of the year.

Just drop me a line to the editorial address – maximum of three nominations plus, optionally, the game you'd most like to see released for the Beeb and I'll bring you the results as soon as possible.

That way we avoid the unfairness of my votes for games not even released yet! I look forward to your choices and will jot down some more considered comments about the eventual winners.

Codename: Droid

I keep getting pleading letters from you for help for the excellent *Codename: Droid.* What could be better, then, than loadsatips from Dugald Holmes of Epsom. And I'm still working on a complete solution for you.

But, just before the tips, do look out for Droid's co-coder Martin Edmondson's work on a forthcoming Superior ST game, provisionally called *And All Because* – the graphics are stunning. I know we're not an ST mag, but it's good to see such a friend of The Arcade fulfilling the promise that *Ravenskull* and Droid held.

Anyway, on with the tips. First, remember that the microfilm provides a map of the game – use it regularly. When shooting a Volgan towards the top of a rope, hang just below his line of fire – you can shoot him, he can't shot you. If you can get over or under a Volgan, he won't turn around – useful for stationary soldiers. To cope with moving Volgans, watch their pattern of movement and then mine them. And, after mining, run in the opposite direction or climb a rope or crawl to avoid bullets.

It's Sharkie!

I hope by now that you've all picked up a copy of the excellent *Shark* from Audiogenic. If so, you might appreciate this short cheat for extra lives from Lauderdale of Shaftesbury.

First LOAD"LOADERS", 1, RUN, define keys and colours, then whilst game is loading press ESCAPE and type 2675 ?&61FB=255 and then RUN. This is for the disk version.

Repton Cracked!

Scarcely a day after its release I get a pile of passwords for each new *Repton* game from Superior, usually not usable for several issues because of the competitions. However, use of the passwords will not allow you to cheat on competition entry because of some nifty coding by the lads in Leeds so here, courtesy of Richard Green from Birkenhead, are the passwords and codes for *Repton Thru Time*:

Prehistoric:
A: PREHIST: 12345
B: HEATERS: 16494
C: HILLOCK: 29652
D: PILFERS: 28265
E: MEDIATE: 25655
F: COMPACT: 9761
G: CARTOON: 43981
H: TUBULAR: 35862

Egyptian:
A: EGYPT: 8473
B: FAVOURS: 5012
C: HAPPENS: 48238
D: PERSONS: 2247
E: CONQUER: 31761
F: EVENING: 19495
G: MASTERS: 52592
H: PIMPLES: 51035

Victorian:
A: VICTORI: 54066
B: MERCURY: 57950
C: CLEAVER: 62809
D: BINDERS: 31463
E: CONFUSE: 35584
F: JINGLES: 10659
G: DOLPHIN: 45367
H: MINSTER: 23180

Present Day:
A: NOW: 54524
B: OCTAGON: 21370
C: CASTLES: 48417
D: CHARLES: 9698
E: GREATER: 58449
F: BOOKLET: 23963
G: FUNTIME: 64332
H: SAVOURS: 29294

Future:
A: FUTURE: 33776
B: ORACLES: 1119
C: STAPLER: 36126
D: DANCING: 46223
E: FANCIER: 48425
F: BANANAS: 34409
G: EVEREST: 54136
H: KINGDOM: 53546

So how do these people crack the codes so quickly? Surely they can't have completed the game? No, of course not. What they do is use something like Richard Koten's edit code and password lister – see listing 3.

Plan B

I've been threatening it for months, now here it is! Richard Koten's superb map of the ever-popular *Plan B* from Bug-Byte, made up of screen dumps. Hopefully the reduction required to fit it in the magazine doesn't render it unreadable – in front of me, full-size, it is stunning. Thanks Richard.

Hints 'n' tips Check those listings!

All being well, there should be two rather nice cheat listings, both from the strangely named 'RT' Mega Hacker – who brightened my day with a cute loading screen for his cheat disk.

List 1 is quite long (thank Tynesoft's disk protection for that) but will give you up to 255 lives and grenades for the excellent *Saigon.* Just type it in, chain it and away you go. Disk only.

List 2 is rather more reprehensible – it will display the relevant graphics for Anco *Strip Poker II* - a game so elusive that even I haven't seen a copy yet, though I expect to review it here next issue. Again type in, chain it and away you go. Again disk only.

Say what?

All the way from New Zealand comes a note from Amadeus, pointing out that with a little manipulation you can see a small devil's face in the *Ravenskull* title page. Huh?

All you need to do, apparently, is type and run this short program:

```
10 MODE1
20 *LOAD RPIC 2EC0
30 FOR I%=0 TO 640 STEP4
40 FOR Y%=0 TO 1024 STEP4
50 GCOL 0,POINT(640-I%,Y%)
60 PLOT 69,640+I%,Y%
70 NEXT
```

This displays a copy of the screen in each corner, mirrored down and across. Sounds whacky to me!

Stryker #2
©T.Oliver 1988
ZAP!
OUT OF THE RADIOACTIVE MESS SHAMBLES A HUGE FIGURE THE IDENTITY OF WHOM WAS ONLY KNOWN BEFORE AS JOHN STRYKER - A REAL HAIGHT ASHBURY SAN FRAN CRAZY DUDE TRIP-OUT FREAKIE FUNSTER. BUT! THE HULKING MONSTER NOW STALKING THE STREETS IS FILLED WITH A BURNING, PASSIONATE, RAGING, HORRIFYINGLY DESPERATE DESIRE TO....
KILL SOMETHING!
CONSCRIPTION
HELP ME NOW
I WANNA ENLIST!
YES SIR? NOW THEN...
OH MY GOD!

*LOADing soon (from the PC Show)

Those of you who've ever been to the PC (formerly PCW) Show will know how exciting it is – loads of company, lots of arcade machines to play (all for free!), hot news, the occasional freebie – in short, gamer's heaven.

Imagine then the disappointment of your correspondent as he wandered from mega-stand to mega-stand to be met repeatedly with the chill phrase: "No, nothing planned for the BBC, I'm afraid." Oh, well – there's still a fair bit of news for you, so let's go!

First, a quick update from Superior. Next games due are the four-way scroller *Exile (early demo at the show suggests a combination of Citadel, Codename:Droid* and *Starquake*!), Alan Butcher's Lloyd-Webber tie-in *One Night In Bangkok* and the tentatively titled *Repton Infinity* - with claims from new product manager Steve Hanson that this will be "the last one". Except for the Archie *Repton,* that is – due this year with a 16 colour editor, all the *Repton 3* screens onwards and a whole new lease of life for the lovable lizard. There's also other major Superior news, but you'll have to wait a paragraph or two for that.

Further ahead, things grow dim. *Galaforce II* (previewed here exclusively a few issues back) is likely to appear on a compilation – now that is dumb all over, the game is a real winner – the much heralded mystery game *3DM* is now history and such delights as *Elite 2, Haunted House, Zorbicos* and *Thrust II* lie far in the future. Of no interest to us, of course, is the increasing number of ST games emerging from Leeds.

Slowdowns too at Maynard International/ Top Ten with *Bogie's pick* on fairly serious hold, *Temple* put back and *Deadenders* and *Dojo Dan* reasonably unlikely to appear. Things will become clearer when new software developer Henry Smithson gets his feet back under the table.

Quiet times from our friends Tynesoft with *Summer Olympiad* on the Beeb not ready for the show – still, the screen shots I've seen look interesting. Next we can expect *Superman: Black Monday* (with major input from DC comics – Superman versus Darkseid and his minions with each level opening out from a comic book page) and the next sports simulation (would you believe *Circus Games*?) the only glimmers of light in the depths of winter, apart from an SAS-type game called *Mayday Squad.* Meanwhile don't expect *Leaderboard* for a looong time or *Journey To the Centre of the Earth* and *The Magnificent Seven* until next year.

Forget too about Power House's *Freedom Fighter* and *Tomb of Syrinx,* US Gold's *Chernobyl Syndrome* and CDS' *Colossus Mah Jong* and *Colossus Roulette.*

Speaking of CDS, there is some big news, despite the disappointment of the new *Colossus Chess 10* not being planned for the Beeb. At the show a deal was signed between CDS (Blue Ribbon) and Superior and you should start seeing 15 Superior games appearing on back to back cassettes at £2.99 for Model B, B+ and Master. The first 15 games are: *Percy Penguin, Mr Wiz, Smash & Grab, Repton, Deathstar, Repton 2, Citadel, Karate Combat, Thrust, Galaforce, Stryker's Run, Ravenskull, Codename: Droid, Crazee Rider* and *Syncron.* The claim is that this is Superior's entry into the budget market – funny, I thought that was what the *Play it again, Sam* series was supposed to be. Also due early December will be a follow-up to the very successful *Brian Clough's Football Fortunes* - and all that soon-to-retire-to-better-things PR honcho Dave Carlos would divulge (despite an attempt to loosen his lips with a second *Perrier*) is that it will be another board plus computer game. Finally, at the £1.99 level you can expect *Hi-Q Quiz* – a general knowledge quiz game.

Strange but true – a game set in an 'inner-city horrorscope' will appear on the Beeb! We're talking *Joe Blade 2* from Players – we're not sure quite when.

Coming from Mandarin for the Master is a 'blockbuster' adventure – *Lancelot.* A tie-in will involve a £5,000 treasure hunt across the UK.

Do you remember how excited we were at the prospect of *Pacland* from Grand Slam? Now the word, I'm afraid, is – no plans. What you can expect from the Bug-Byte label is *Monkey Nuts.* Fair trade?

Unusually, perhaps, Elite is back in the BBC market with a couple of games. First, a rerelease of *Commando* in October on the budget £1.99 Encore label. Secondly, a licensed quiz game, *A Question of Sport, which should be distributed/marketed by Superior. Unfortunately nobody on the Superior stand wanted to comment and nobody at the Elite stand seemed to have even heard of the BBC.*

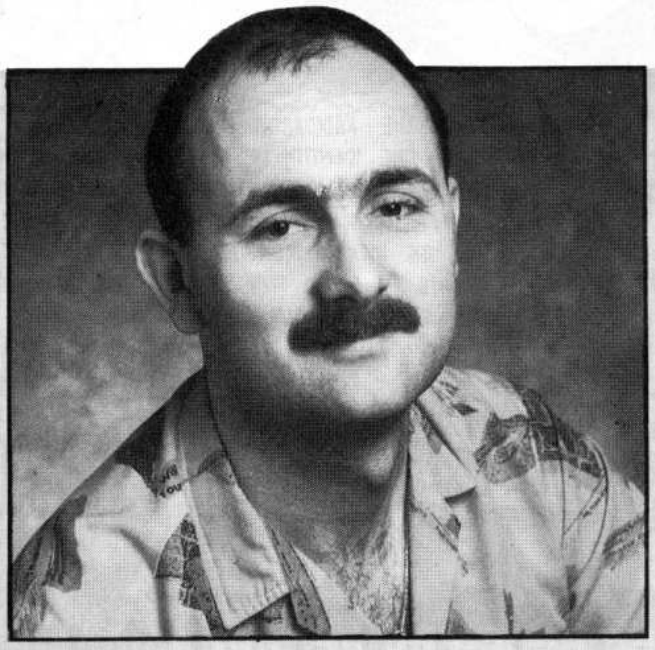
And what of the funsters at Domark? Lots of news about Spitting Image, Return of the Jedi, Live and Let Die and *Trivial Pursuit – A New Beginning* - brace yourselves, none of which are planned for the Beeb. What is on offer is another TV game – the almost unmentionable *Blockbusters!* One consolation, however – we won't be seeing *Bob's Full House* either!

Last but not least, we come to Alternative who, quietly, are churning out a fair bit of product for the Beeb. Worth looking out for will be a disk compilation of sports simulations, prepared for the Home Computer Club and, in early '89, *The Munsters* and *Postman Pat.* Meanwhile the reissues at budget price continue with, I think, *Olympic Spectacular, Psycastria, Triple Decker Rockfall, Soccer Boss* and *Video Pinball* as yet unseen.

And Impact are planning *Cheat It Again Joe, 3* plus an Archie version. Phew!

And Finally...

And finally I'm about to vanish on holiday. Postal workers willing, you can write to me in my absence from the country: **Dave Reeder, The Arcade, A&B Computing, ASP Ltd, 1 Golden Square, London W1R 3AB.**



Bruce Smith

BRUCE

Bruce Smith writes on his experiences at the PC show and has a quick look at RiscOS as well!

As you read this the Micro User Show will be upon us and for many it will be the first chance to indulge in all things Acorn since the same show earlier this year. In the absence of the Acorn User Show many Acorn devotes took the chance to attend the PC Show where Acorn and several familiar names had stands.

Those that attended had a field day on the Acorn stand where a wide range of new Archimedes products planned for launch next spring were on display. Not least Arthur 2, the new Archie Operating System now christened Riscos. Those who attended one of the many demos will have come away rather impressed (I should say!-Ed). I managed to have a good hands-on a week earlier at the Econet Conference and my first impressions were one of 'bees knees'. I have since had no reason to change my mind – though I should add that I have not had a chance to get at it at a programming level. This should have been rectified by the time you read this as Acorn are issuing EPROM versions of RISC OS to developers shortly.

The Acorn development team have included a wide range of extra facilities in RISC OS not least a multi-tasking capability. In plain English this means the ability to have several programs running at once. So it is eminently possible to have a screen containing three windows with one running a wordprocessor, one running a spreadsheet and one running a database. What's more you can even save data between the applications which effectively provides a powerful Mac-style cut 'n' paste feature.

"It is eminently possible to have a screen containing three windows running separate applications . . ."

Acorn also used PCS to launch their desktop publishing package called Acorn Desktop Publisher. Again an excellent product and well worth the asking price of around £130.

Riscos is clearly being marketed by Acorn as the standard Archimedes Operating System and the current OS, Arthur 1.2 has been a stop-gap in much the same way as MOS 0.1 was for the Beeb all those years ago. As such they are intelligently keeping the cost of upgrading down. I understand it will be £29.95 for a limited period which is ridiculously cheap.

I can best sum up my own feelings about Riscos by saying that I would actually now part with my own money for an Archimedes running it. However I would warn you that to get the maximum from it you really would need a hard disc system and at least 2Mb of RAM. Take advantage of the offer though it'll be the best thirty quid you'll spend for some time.

What Commodore, Atari and Apple failed to do, Acorn achieved in one fair swoop at the PC Show – killing the Beeb in its B, B+ and Master guises well and truly off. True another 40,000 Masters have just been produced but these are to satisfy the demands of existing users, particularly education who might want to replace an old machine or upgrade a network from six to seven Masters.

There weren't too many Masters, let alone Beebs, on show on the Acorn stand, though I did manage to find a 128 in the depths of the stylish stand – (driving all the other systems perhaps!).

The Archimedes is clearly where Acorns future lies but what of existing Beeb and Master owners? If you are one then you control your own destiny. The London Micro User Show earlier this year was poorly attended and what's more the spending power of those who attended was down. Many exhibitors came to me (why?) to complain of poor takings and that they would have to look along new avenues of revenue if it continued.

In fairness to all it has to be said that many of the same exhibitors have had nothing new to sell for the past couple of years so such situations are likely to occur. The Dabs Press stand, I'm glad to say, was not so badly hit (more Ad royalties for that one – Ed), but then there were several new books on show for the first time. But without the commitment in the form of hard cash from existing Beeb and Master owners software producers will lose interest. And ultimately that means you will too.

See you at the Show?

Write to Bruce! Send us a letter to Bruce's newsdesk c/o A&B Computing, No 1 Golden Square, London, W1R 3AB

3½

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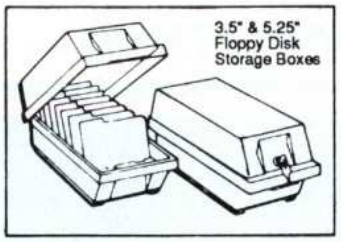

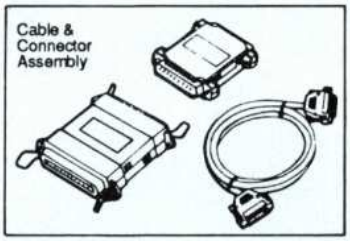

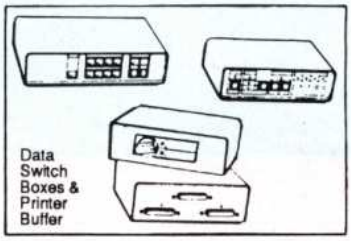

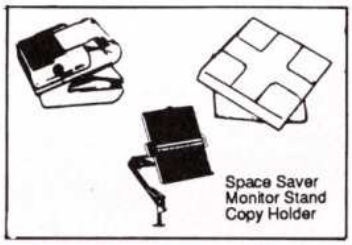

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William Benjamin

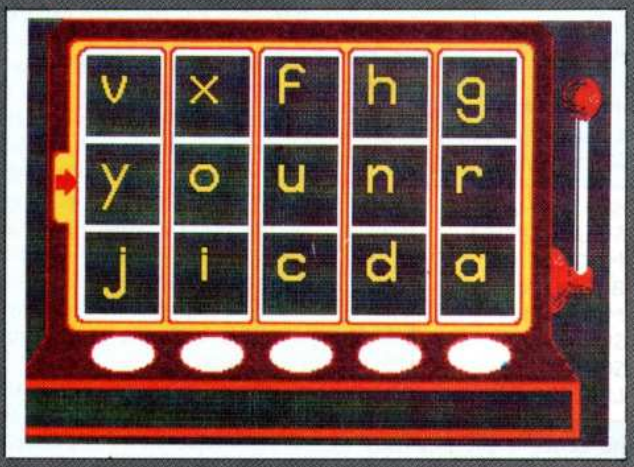
Is there a place for computer games in the classroom?

This month I take a look at the role of play, its advantages, general aims and a selection of computer software and activities where an element of play dominates.

But firstly is there justification in letting children play computer 'games'? The computer is a powerful vehicle when it is used in the context of the curriculum, forming an integral part of the child's range of learning experiences.

Used in conjunction with other media a great deal of thinking and discussion is encouraged. The exchange of ideas more often than not results in the children learning from each other and not just from the teacher.

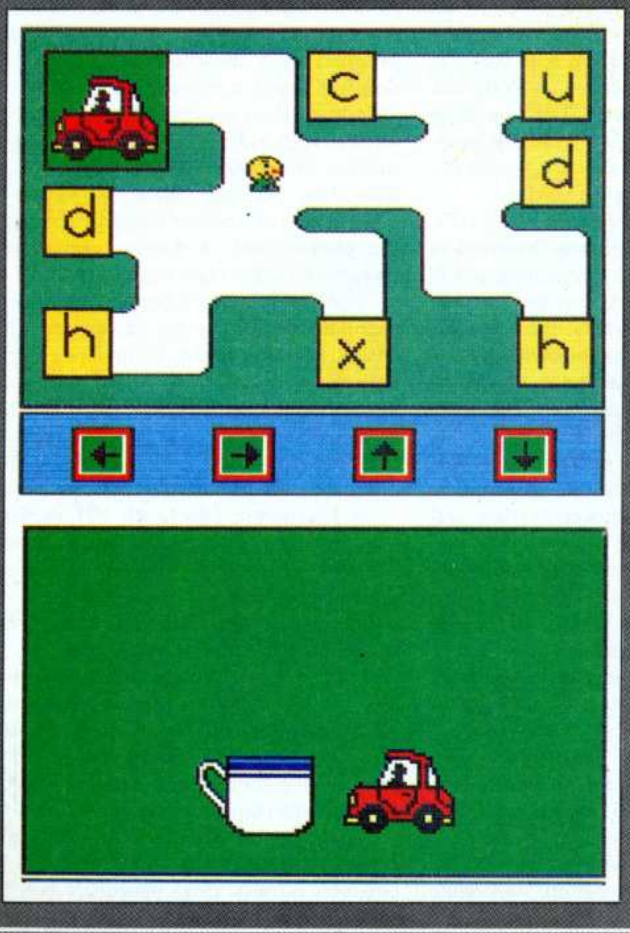
THE ROLE OF PLAY



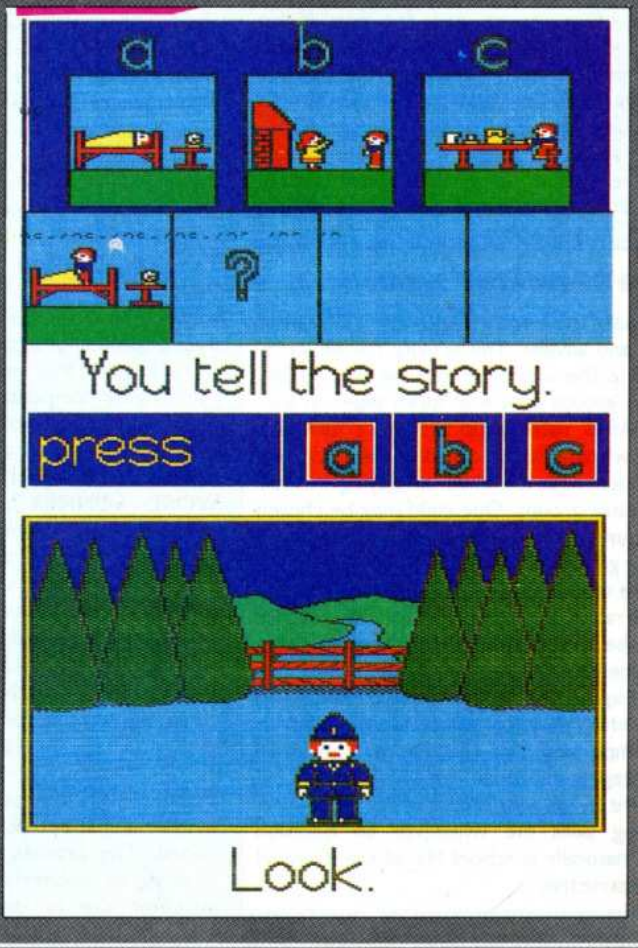
'Wordspinner' – ITV Software.

Should a teacher use games in the classroom situation?

Let's get one thing straight; a computer game, in the educational context, should not primarily depend on fast reflex actions nor any kind of time element where the child must beat the clock. The end product may or may not be the game itself; the key element in as far as 'educational' games are concerned is problem solving.



'Animated Alphabet' – Sherston Software.



'Teachers Cupboard' – Sherston Software.

Although children are engaged in play, they are in fact practising problem solving strategies in a 'fun' situation. Such computer activity along with other related tasks allow children the opportunity to work in those areas of the curriculum so important for today's youngsters and to which more time must be given:

– **problem solving and decision making**: where computer software provides a particular set of educational tools allowing wide ranging strategies to be employed.

– **thinking skills**: where carefully selected computer activity can help children make the best use of their intellectual ability and by providing them with opportunities to practice specific thinking skills, can help them think more effectively in a wide variety of situations.

– **discussion**: where computer related activities provides the opportunity for children to be involved in worthwhile, focussed discussion.

– **cooperation**: where the activity fosters cooperation among individuals and helps them appreciate the value of working together.

– **observation and exploration**: where computer related activity encourages children to observe and explore hypotheses and hopefullly in the process make connections and discoveries.

– **persistence**: where the learning experience is correctly matched to children's ability and maturity and is also suffiently motivating to encourage children to stick with a task and not give up too easily. Of course the computer is but one source from which these parts of the curriculum can be developed within the school, but it is a very important one.

Each computer-based activity described below, offers opportunities for most, if not all, of the above curriculum areas to be developed, especially where the computer is used by groups of children in preference to individuals. The list is not exhaustive but serves simply to illustrate the point and to offer readers some starting points. Firstly, what is the role of the teacher in all this?

The teacher's role

Essentially the teacher becomes an organiser, guide and adviser. The activity can be introduced to the whole (or half) the class initially before groups of 4-6 children begin in earnest. After each group has had a turn it is often worthwhile to organise them for oral discussion with the children staying in their respective groups. One child may be chosen as a spokesperson who reports to the class his/her group's points.

The teacher can record a summary of the points raised on the blackboard. The teacher must be very careful not to make value judgements which may inhibit the children or encourage them to put forward only those ideas which they feel will please the teacher. It is important that the teacher should be encouraging in his/her responses and should be alert to the possibilities of using the same thinking skills etc whenever an occasion arises naturally in school life where it would be constructive.

Play as a vehicle for learning: the early years

Software for very young children frequently employs a game element in order to motivate children and encourage perseverence. Frequently children are unaware that they are using skills and concepts related to reading, for example, as they become engrossed in the game.

Well designed, skill-based software in the hands of a sensitive teacher can form part of the overall strategy in helping children with specific language difficulties particularly if used in conjunction with a diagnostic approach to learning problems. This is probably one of the rare occasions during which the classroom computer can be used with a single child, as the enormous patience of a machine (compared with that of even the most dedicated teacher) is utilised to effect.

HS Software publish a number of reading-skills programs in a series of six packs entitled *READ-RIGHT-AWAY*. Each program employs excellent graphics and a simple but effective task which the children perceive as a game. In effect the core of each program is practise of a specific reading skill:

SKATECHASE
SOUNDSPORT
MAGIC-E
BREAK-IN
MONSTER
SURFARI
SORTOUT
LETTERBUGS

A feature of the series is the flexibility it offers in terms of the number of players, choice of sounds, and levels of play. So popular is READ RIGHT AWAY with young children that when a program is in use it is difficult to keep other children (who do not require the practice) away! The appealing graphics and sound coupled with the game situation offer enormous encouragement for children for whom reading is a burden.

Equally popular is *WORD SPINNER* (ITV Software – Granada) which was reviewed in the May 88 issue of A&B Computing and is another reading-skills program totally utilising a game approach. Briefly, the software mimics a basic fruit machine but without any gambling or competitive element. Instead of symbols up to five letters are used. The 'play' option can be used as the program stands with a word bank of 1500 (2-5 letter) words. WORD SPINNER captivates children; it certainly helps develop concentration and anticipation of the next letter/word. The program guarantees a word is formed every time the 'word spinner' is rolled. The function keys provide a 'nudge' whilst the number keys provide a 'hold'.

All this is fine in the short term but to be useful in the classroom situation such game-based software should be able to be adapted by the teacher to suit children's needs. WORD SPINNER provides an option for wordbanks to be created, loaded/saved and edited. The process is further refined by allowing all manner of word groups to be built for use in the program: beginning letters, ending letters, set word length, words containing certain letters and random selection of words which all add up to WORD SPINNER being a very valuable tool for teaching phonics.

An optional add-on pack offers Concept Keyboard overlays for either program control or matching games. The glossy, hard-wearing 'control' overlay overcomes the problems the QWERTY keyboard poses for the very young. An endless variety of matching games, using words on the screen with pictures etc on overlays, can be created. Overlay files can be saved and loaded as and when required. Like the READ-RIGHT-AWAY series WORD SPINNER is a truly versatile teaching tool but also great fun for children!

ANIMATED ALPHABET, for pre-school and five year old children comprises three graded activities in which the alphabet comes 'alive' by combining a game element with 26 effectively animated illustrations in order to motivate and stimulate children. The aim of the game is to help children recognise dnd distinguish betweenfletters of the alphabet and for this reason Sherston place a strong emphasis on the phonics of each letter.

Similarly, Sherston are also well aware of the problems a QWERTY keyboard imposes for young children with its apparently randomly placed, upper case letter symbols. From the adult's menu an option for using a Concept Keyboard can be selected. Alternatively, the stick-on letters may be placed on the BBC Computer keyboard to aid letter recognition.

A number of additional options like sound level, duration of each game, and random or selected letters are also available.

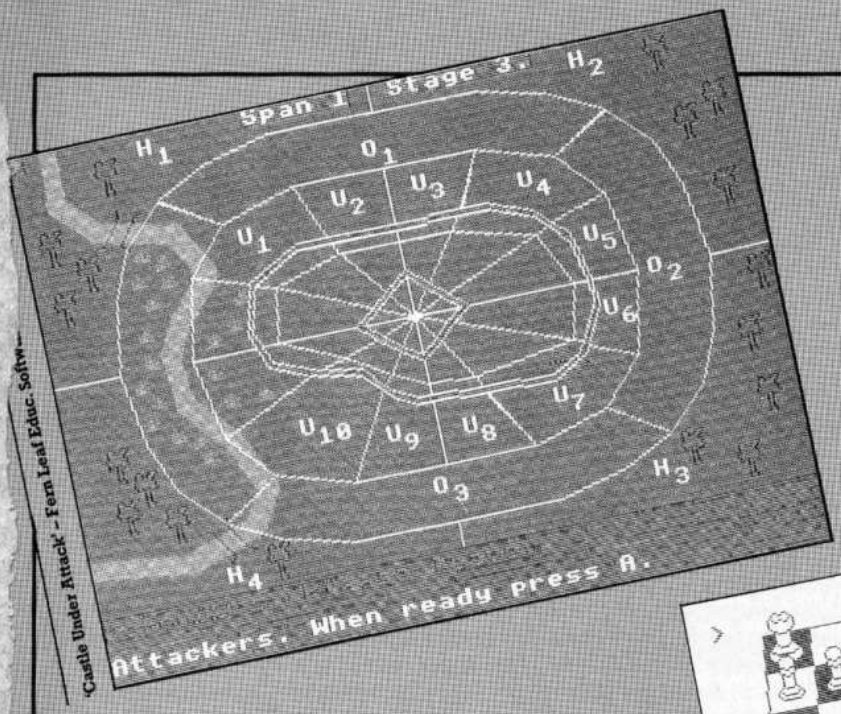
Young children will immediately find *ANIMATED ALPHABET* attractive and fun. A group of four year olds who used this program were absorbed for long periods of time and revelled in the ability to control the little man when selecting the correct letter. ANIMATED ALPHABET however, would be suitable for older children with learning difficulties. Its real value, however, will depend on the teacher's skill in emphasising the phonics and reinforcing reading work undertaken in the classroom.

TEACHER'S CUPBOARD comprises two charming adventures for lower and middle infants. Along with the 5.25in flippy disc are: colourful workcards, a story book, poster, function key strip, Concept Keyboard overlays and teacher's handbook. From the teacher's menu both sound level and choice of input device may be selected.

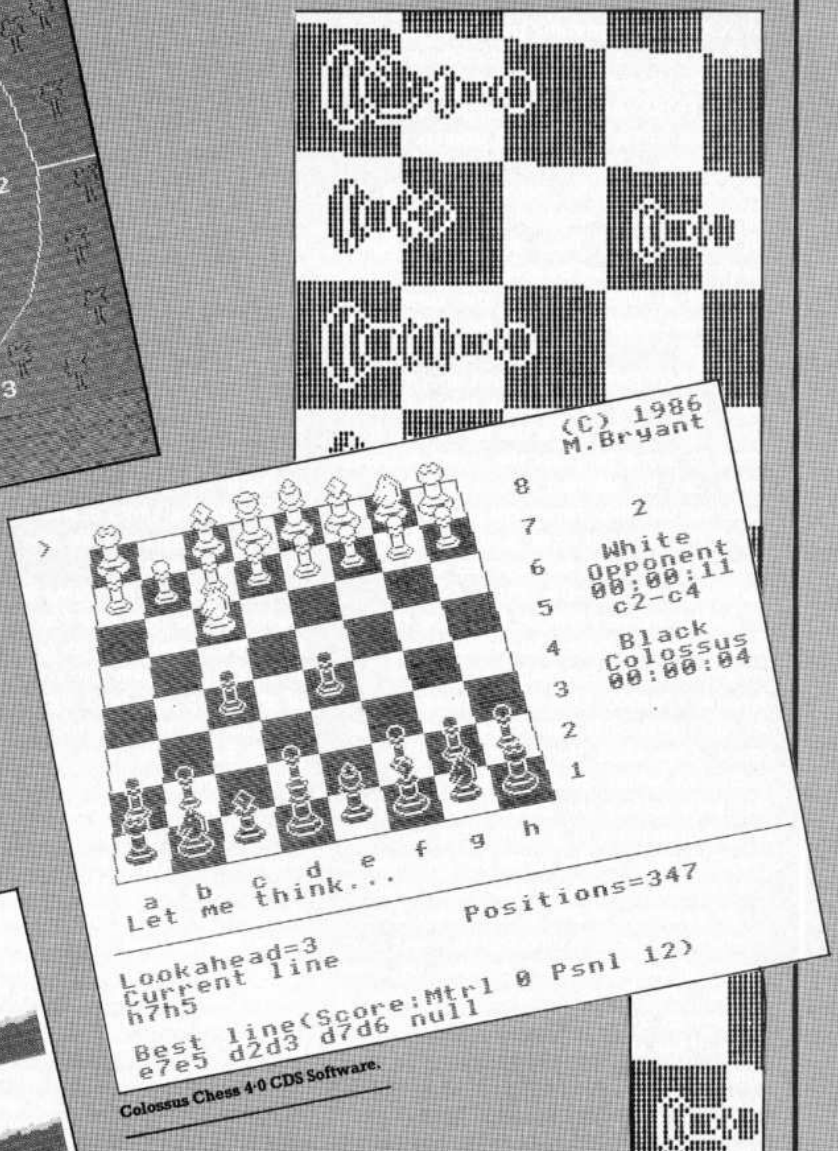
A Microvitec Touchtech 501 version of the software is available from Sherston Software on request. This would represent the most natural means of interacting with either game as the child would simply point to a screen-object in order to select it.

In 'The Apple', lower infants are invited into the world of the teacher's book room which inhabited by enchanted creatures. From here they are transported to a magic land where two visual puzzles must be solved: sequencing and 'I Spy'.

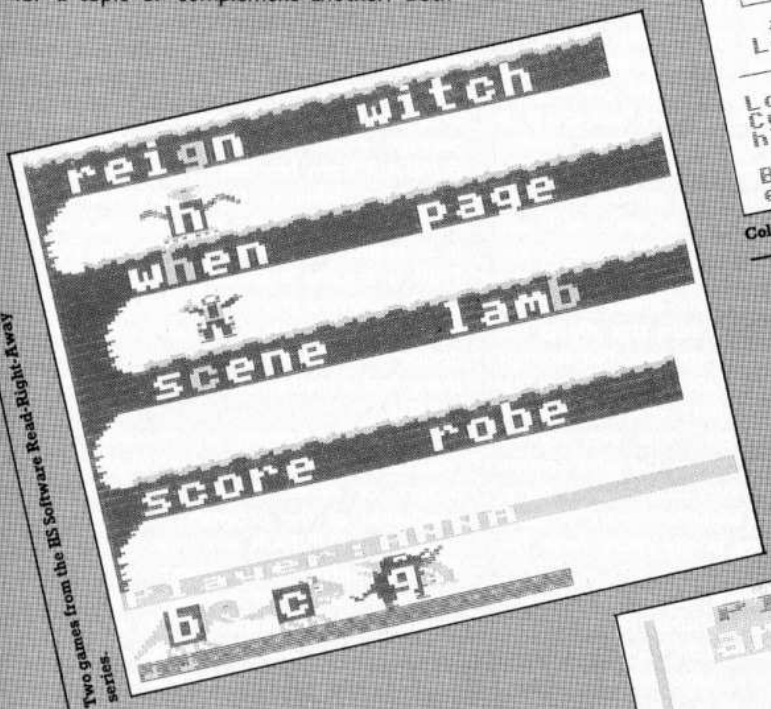
Similarly, in 'The Crown' (for middle infants), the same scenario is used but with two new puzzles: cloze procedure and 'Spot



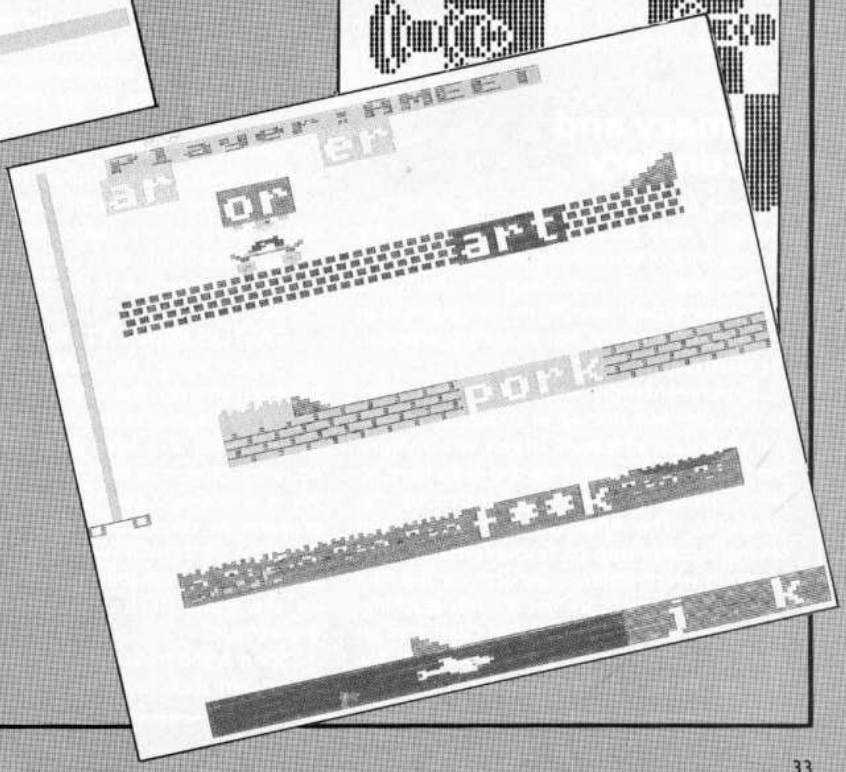
'Castle Under Attack' - Fern Leaf Educ. Softw.



Colossus Chess 4·0 CDS Software.



Two games from the BS Software Read-Right-Away series.



the Difference'. The successful solution to these locates a crown which must be returned to the teacher's bookroom. The animated graphics are delightful throughout and the user-interface well designed.

The TEACHER'S CUPBOARD is a valuable resource which could form a central theme for a topic or complement another. Both ANIMATED ALPHABET and TEACHER'S CUPBOARD are an instant success with infant and first school children – the ever popular adventure game format being the key to each program's success.

The importance of the role of play as a vehicle for learning can be exemplified by the use of games to develop concepts of linear measurement and angles in Turtle Geometry. Turtle Geometry is a very good medium for promoting problem solving and investigative work. For young children at the early stages

of LOGO programming the turtle becomes, as Papert puts it ... "an object to think with."

Once children have learnt the first command, 'FORWARD' let them play with it by using the turtle to measure objects of their own choice.

Another popular activity is using the turtle to find the width of an imaginary river on the classroom floor at different points. Strips of paper can be given to the children to build a 'bridge'. Using the turtle they determine which strips can be used to span the river.

Another game is to position circles of paper across the river and ask the children to take it in turns to make the turtle step from stone to stone to cross the river. A similar game can be devised whereby circles of paper on the floor represent target areas on which the children must guide the turtle. If these activities can be couched in a 'story' framework so much the better.

Angles are very difficult for young children to comprehend initially so one or two games using the turtle can help them learn in a dynamic situation. One of my favourites is to set up a makeshift 'landscape' in the classroom. One child then points out various landmarks whilst other children must turn the turtle to face the chosen place. This can be elaborated on in a number of ways, for example, later on the turtle can be made to visit various landmarks in a particular order.

An extension of this is 'Demolition Derby' in which the turtle is directed to knock over towers of building blocks. Another favourite is 'Spin The Turtle' in which the turtle is placed into a 35cm diameter circle and a group of five children are each issued with 10 paper counters. One child operates the computer whilst the others play. The operator announces to the players the next turn command and they must place one counter at the point on the circle's edge where they think the turtle's nose will point. Only those who guess correctly keep their counters.

There are hundreds of similar games which will help children learn difficult concepts; this is just a small sample. Many more are listed in Valiant Technology's excellent book *'Geometry Microworld for the Valiant Turtle'*.

Primary and secondary

Dressing up problem solving in an adventure format is very popular indeed and arguably the majority of educational software released in the past year has been of this type. Computer-based adventure programs can generated a creative and imaginary world in the classroom.

Experimentation with ideas, discussion, formulation and sharing of strategies, drama and simulation all feature largely in adventure programs. Traditional drills-and-skills have no place in the microworld generated by the computer. The emphasis is on organised teachers committed to resource-based education in which children are actively learning and where teachers are not actively teaching. The micro is used to make the classroom an exciting and stimulating environment for children. What are the important criteria for selecting a good adventure program for use in school?

1. The content must be fresh and completely original.
2. The content should encourage work across the curriculum.
3. The software design and materials should meet the needs of large groups of children not just individuals.
4. The software should aim to encourage a good deal of work away from the computer.

These four criteria apply equally to simulation software. Like adventures, simulations also tend to blur the differences between 'play' and 'work' as exemplified by one of Fernleaf Educational Software's recent publications: *CASTLE UNDER ATTACK*. CASTLE UNDER ATTACK is a strategy type game set in medieval times in an imaginary country. Groups of players take one of two sides: attackers or defenders.

The object of the game is to capture the leader of the opposing force or, like chess, force the opposition to retire. In addition, attackers must gain entry into two sections of the keep and hold them and defenders must survive the selected time spans in the game. Each side must secretly plan their strategy for attacking or defending the castle. This involves deploying soldiers and machines.

Central to the program is the map on which troop/machine movements and interactions take place. The area in and around the castle is marked into sections and it is the movement of men and machines into these sections that requires careful planning to achieve success. The attackers have access to mangonels, battering rams and seige towers; defenders can utilise fire arrows, mangonels and hot oil. Further game options offer the opportunity to play over 6 'spans' with one body of soldiers or over 7,8,9 or 10 'spans' with three different types of fighting personnel. The choice of game affects the rations available per 'span'. In turn this affects the soldiers that each side chooses. No attempt is made in the program to simulate a real battle or seige. Soldiers who fight, score points. When soldiers come into conflict with each other (ie occupy the same section on the map), an 'interaction' takes place. During interactions soldiers who are defeated are not killed; they simply retire from the conflict.

Soldiers on parole do not take part in further conflicts but continue to use rations. Naturally, only some of the many elements of such a situation are represented eg solving logistical problems of securing enough food for the force and using the war machines to the best advantage.

CASTLE UNDER ATTACK does provide the opportunity to illustrate differences between strategy and tactics. A SAVE/LOAD facility to enable incomplete encounters to be continued at a later date. This obviously complex game is suitable for lower secondary pupils providing a good deal of precomputer preparation takes place. The children must certainly be familiar with the program, its techniques and capabilities before embarking on the game. It is must for the history department.

Science and measuring seem very unlikely curriculum areas in which the game element should be employed. However, it is certainly put to good use in *MEASURE AND TELL* from Clwyd Technics. MEASURE AND TELL is an excellent cross-curricular package literally packed with features, and has just about everything required for upper primary aged children to begin all manner of investigations into temperature changes. The package is well supported with numerous teacher/child resources including sample experiments, ideas cards, even recorded music for music-and-movement lessons!

Everything appears to have been thoroughly trialled and is very impressive indeed. The software is outstanding, providing everything pupils require to record, display, analyse and print out experimental data. Despite the high degree of sophistication, the pack is not difficult to use and this is due in no small part to the 'play' element incorporated in the overall design. This takes the form of the delightful 'Battle of Sizzle and Chill'. The whole pack is designed around this theme that provides a context which younger children can relate to in order to make the content of pack comprehensible and meaningful. Each experimental task is an exploration and investigation of the 'battle' between heat and cold. MEASURE AND TELL is one of the best commercially available computer resource packs which fulfils all of the curriculum areas outlined earlier.

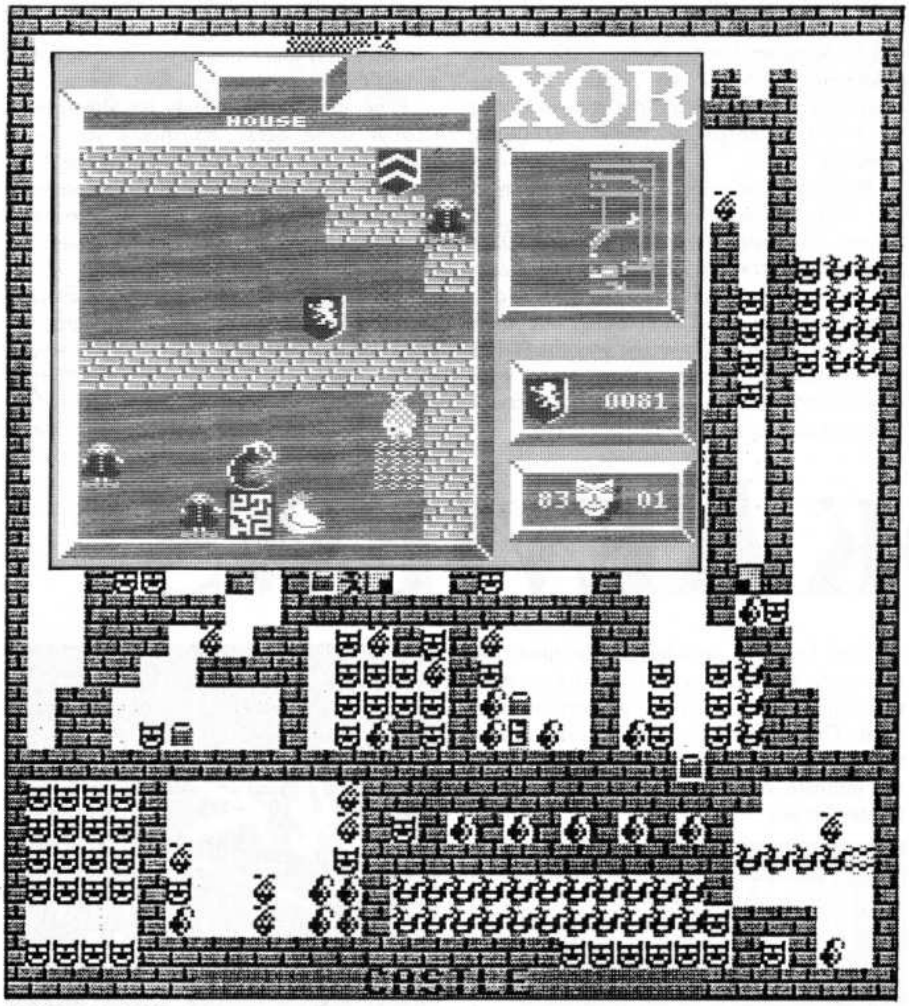
Play has been embodied most successfully in mathematics software in order to provide a medium in which basic skills and concepts are reinforced or practised. The number of programs adopting this approach is legion. A package which is particularly successful is *FUNFAIR* from Northern Micromedia. Designed for middle to top juniors, it aims to introduce the need for basic numeracy skills in as realistic a situation as possible. FUNFAIR is a game based on a visit to a fair. Children have a given amount of money and must explore a map of the fair ground. They decide which sideshow they will visit and there find a mathematical or logic problem to solve.

Successful attempts are rewarded with 'vouchers' which may be exchanged for a picture or other tangible reward at the conclusion of the program. Adventure or simulation? FUNFAIR is a mixture of both. The use of play in this context coupled with the large number of accompanying activity sheets, pictures, maps (all of which are photocopiable) and a Concept Keyboard overlay combine to produce a very stimulating means of reinforcing basic language and mathematical skills including problem solving and decision making.

Games for games sake

All of the software discussed so far has been linked very closely to a variety of curriculum areas. However, computer games which offer no direct subject links can still provide most or all of those aspects of the curriculum so important for today's youngsters.

In addition, children quickly discover the value of keeping records of their strategies and moves on paper when tackling such tasks. Games like Draughts, Othello (Reversi), Fox-



'XOR for Schools' – Logotron.

'n-Hounds, Monopoly, Bridge and Scrabble offer children one particular advantage: as the opponent is a very patient non-human, a group of children can quite happily challenge it. It is because these games promote group-problem solving situations that the computer versions are so valuable in the classroom. Examples of 'computerised' board games abound; perhaps none more so than chess.

When I ran a chess club for children after school hours, one of the most popular activities other than the current tournament was to play the latest chess program. Undoubtedly, the most popular chess program was *COLOSSUS CHESS 4.0* from CDS Software. Children in the club would play a continuous game in random groups during the wait between matches with human opponents; thus in the space of one hour, almost all the children had made at least two moves against the computer: a very patient opponent indeed!

COLOSSUS CHESS has a number of features which made it particularly popular with young chess players. It has an estimated rating is 1850+ ELO (156+ BCF). Running on all Acorn computer models but handicapped by the lack of memory on the Model B and Electron, this chess program must rate as the most powerful for a micro computer system to date. Its portability makes it ideal for schools with a range of machines. The 64K (Master 128) version is packed with features which make COLOSSUS CHESS an ideal chess tutor system with this and the Compact computer. It has a supervisor mode which can be used to monitor (with clocks) the game between two human players which it can later replay and save for further study. It has an opening 'book' of about 3000 positions, handy for children to practise set openings and variations. Similarly, the disc contains a range of problems and 35 games for replay and study.

COLOSSUS CHESS permits backwards and forwards stepping through a game allowing children to correct errors and learn from mistakes. Above all, COLOSSUS offers the user a great deal of control over the program's parameters thus enabling the chess teacher to tailor the program to children's needs and abilities. Chess teachers with young players of high ability in their club will find COLOSSUS CHESS 4.0 a most worthy challenger.

One strategy game which is particularly popular with all children is *XOR FOR SCHOOLS* (Logotron). Regular readers of A&B Computing will remember it simply as XOR, a maze game in which players control two 'heroes' (or heroine?) and with the help of maps navigate around a maze rather like the popular REPTON series. The aim is to collect objects in the fewest possible moves and to pass through a door to escape. Along the way a series of obstacles in the form of logical problems are encountered. These are icons which display differing dynamic characteristics, which interact with each other.

The heroes are used to manipulate the icons but it is up the players to discover what each one does how icons interact. XOR FOR SCHOOLS allows children to design both mazes and the icons found within the maze then play each stage of the game and replay it as necessary in order to make alterations.

Once familiar with the game children quickly latch onto the attributes of the various elements and how they behave and interact, the process of designing their own scenarios begins. The task comprises designing the maze and a range of puzzles to be encountered.

Initially, mazes can be designed away from the computer using the planning sheets provided. Sensibly Logotron have also provided screen dump and save routines so mazes can be printed out, worked on away from the computer then the file reloaded for modifications when required. The process of maze design, puzzle testing and modification takes place but in an extremely enjoyable context with a tangible result to show for it all.

Conclusion

The role of play in computer software is a vital element in helping to ensure that children will be be making decisions and solving problems as well as discovering and practising fundamental thinking skills. Don't simply rely on computer software to fulfil all requirements – it can't. The crucial point is to ensure that children be given ample opportunity to transfer their learning from one curriculum area to another. The more that thinking skills etc are practised in as many different situations, the more likely it is that they will be remembered and consciously used in real life situations away from the classroom.

Factfile

1. ANIMATED ALPHABET, 2. TEACHER'S CUPBOARD are available from Sherston Software, Swan Barton, Sherston, Malmesbury, Wiltshire SN16 0LH, for the BBC B, B+, MS128, Compact, Priced 1. £16.10 2. £20.13

CASTLE UNDER ATTACK is available from Fernleaf Educational Software, Fernleaf House, 31 Old Road West, Gravesend, Kent DA11 0LH, for the BBC B, B+, Master 128, Compact, priced £17.95

MEASURE AND TELL is available from Clwyd Technics, Unit4B, Antelope Industrial Estate, Rhydymwyn Nr. Mold, Clywd, CH7 5JH, for the BBC B, B+, Master 128 £59.45 + VAT (disc)

FUNFAIR is available from Northern Micromedia, Resources Centre, Newcastle upon Tyne Polytechnic, Coach Lane Campus, Coach Lane, Newcastle Upon Tyne NE7 7XA, for the BBC B, Master 128, priced £14.00

COLOSSUS CHESS 4.0 is available from CDS Software, CDS House, Becket Road, Doncaster DN2 4AD for the Electron, BBC B, B+, Master 128, Master Compact, price: £14.99 (disc) £9.99 (cassette)

XOR FOR SCHOOLS is available from LOGOTRON, Dales Brewery, Gwydir Street, Cambridge, CB1 2LJ, BBC B, B+, Master 128, Master Compact, price: £15.00 + VAT (disc)

BOOK REVIEWS

Clive Grace looks at the latest books for the Beeb

The advanced Master reference manual

This book represents Watford Electronics' first foray into the world of publishing, and I must admit that it came as a bit of a suprise, this is a truly great book! This was the sort of book we all needed when the machine first came out!

Being spiral bound means that it is also quite rugged. It is 288 pages long with *two* maps at the end, being of the schematic type, so there is an accurate breakdown of what goes where earlier in the book. In fact, you could consider the *book* to be the accurate breakdown as there isn't much that this weighty tome doesn't deal with.

Starting at the front of the book we have the Master series' general achitecture explained in a clear an lucid manner explaining the basic machine (core and external) and going really into the guts and inner workings of the thing by explaining I/O and the 2Mhz/1Mhz bus. External second processors are also detailed here.

This is all followed by a circuit description and a detailed look at the circuit operation, making reference to said maps.

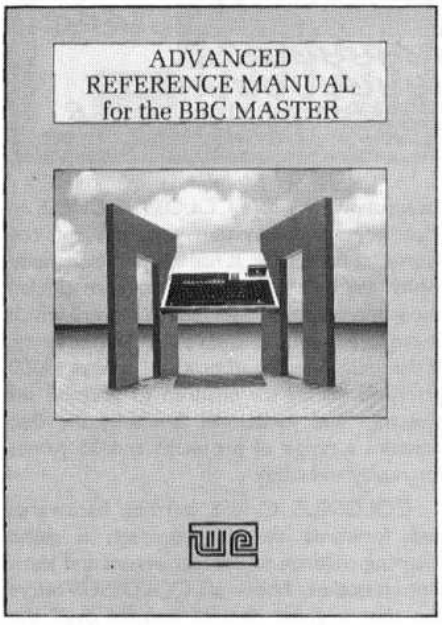
The memory map is old ground apart from the usual differences (in shadow RAM and the ROMSEL option that has changed to take into account the Megabit chips), the Slow Data Bus is also explained, as is the Keyboard controller, the screen display and User Port.

After all this old ground it is refreshing to come across information on the serial processor such as the UART and details on the Peripheral bus controller.

But what most people will buy this book for is the MOS description – as detailed as the work by Bray, Dickens and Holmes all those years ago for the BBC Micro, this book is *the* breakdown of the Masters MOS and its features, not to mention the various differences in VDU workspace, the time independent functions and the second 32K of RAM – that enigmatic RAM area hardly accessed.

We finally move onto the description of the dual processor systems such as the second processor architecture the tube protocols and the the Z80 second processor. The section on the turbo and the Z80 second processors was quite interseting, but what was *really* interesting, was the way the 80186 (the Master 512) co-processor acted with the Master, the way Acorn got past screen accessing and so on...

This book is wonderful. Detailed and thorough, it is worthy of the machine it so expertly describes, not to mention the clear print. The fact that the manual is too dry to read like a book shouldn't put you off, this is the ultimate reference manual for the BBC Master Series.



ARM assembly language programming

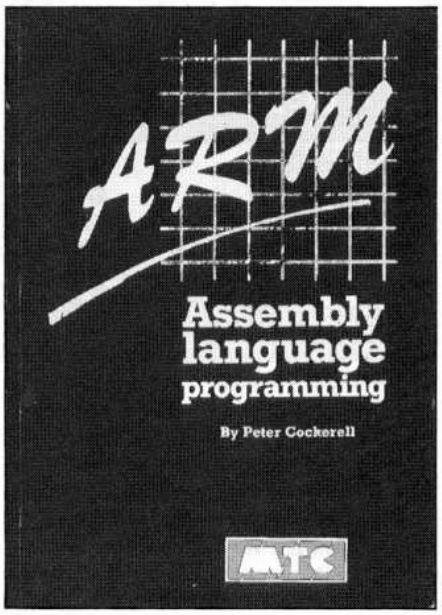
ARM Assembly Language Programming is an interesting title – published by Computer Concepts' publishing arm (pun not intended) MTC, this book is set to be *the* reference manual for the ARM – for the time being.

It it 136 pages long, has no illustrations whatsoever (only diagrams), it is more of a breakdown of the generic ARM processor than a guide to programming - much like Zax's Programming The 6502, but without the long listings.

It is also interesting to note that this book is the first to be published by CC, and as a result, it has heralded a great deal of interest. Most of the book is dedicated to describing the ARM's instruction set in great detail – far more than some people need, but the information is there should you so desire it at some time or another.

Programming techniques are also looked into at some detail, so should you be a complete beginner to programming the ARM then the book gives a few useful pointers to get you going with, but there will probably be too much information for beginners to comfortably accomodate!

ARM programmers that will get on best with this book are 6502 Assembly Language programmers posessing a detailed knowledge of the Archimedes' hardware and software devices, you will need the Advanced Reference Manual for the Archimedes (both



volumes) and I would suggest getting some sort of programming tutorial in oredr to try out a few of the concepts hinted at in this book.

If you want to program Acorn's laser card, or you wish to use the PC environment with the add on ARM co-processor, then you will need this book as the supplied documentation is really not suitable for programmers.

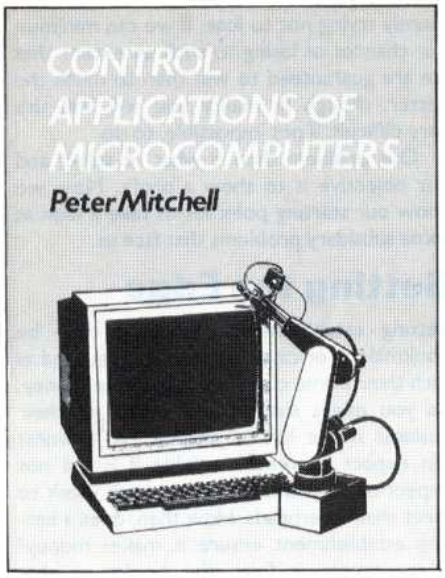
It is available from bookshops or directly from Computer Concepts.

Contact: MTC, Gaddesden Place, Hemel Hempstead, Herts, HP2 6EX.

Control applications for microcomputers

I had often wondered why or how people joined their computers up to pieces of expensive machinery – to prove a point? I think not, but to be honest, this book is written with an enthusiasm that suggests to me that there is a whole subculture out there waiting to be discovered doing things through their computers!

Published by *Edward Arnold,* this is an interesting book, it fires the imagination so



that you start using projects inside the pages of Peter Mitchell's book to control small robot arms, to move objects, to ven make an electronic cat door! (so now there's no excuse for turning off you Beeb!).

Like most of Edward Arnold's books in the past, this book has a fairly systematic approach to going over the subject, it deals with the subject from the point of view of the complete beginner, it has particularly simple and straightforward diagrams that are practical are are explained in detailed, the book includes a list of the necessary components needed to complete a project.

The book examines both digital and analogue circuits and has a really good introduction to assembly language programming with plenty of examples and exercises, this book deserves a good look if you are considering hooking up your micro to a computer.

The complete BBC computer user handbook

To be honest I wondered if these books were ever written anymore! – you know, the ones with general pieces about general subjects that are designed to get the user on the right road – heavens knows I've seen enough of them, but there was still something about this book that made me want to read it.

It is probably the fact that John Lockley and Douglas Tate have written in 324 pages what it has taken thousands of words in hundreds of books to say in the past, it is well written, there are plenty of examples and more than enough life in the text to rejuvenate even a tired old hack like myself!

But seriously! I was sitting down one evening reading this book and I found myself reading this book from one end to another and enjoying every minute of it! Not that this book is supposed to be enjoyable, but the fact is that the book brings back such a sense

of *Deja Vu* when I come across various troubleshooting pages that I feel I am almost transported back five years ago!

This is a Watford Electronics publication, and if this the quality of the publications, then I think we are going to see some very interesting books come out of this stable soon now – although this one will have very limited appeal except for the complete beginner, this book will be a steady seller, especially for education users.

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Graham Kendall

FIXING THE FIGURES

Graham Kendall takes a look at the problems facing the Beeb owner who wants to fix a flutter in his favour

Imagine the scene. You are in a plush casino. You decide to try your luck at roulette. Finding a seat you arrange a moderate pile of chips in front of you. At the request of the casino staff you place your first bet. You win. Your original chips are pushed back to you along with some of the casinos. Before making your next bet you write some figures on a pad you have in front of you. Some simple mathematics informs you what your next bet should be and where you should place it. You win again. Chips are pushed your way and your calculations tell you what your next bet should be. This time you lose. The croupier rakes in your chips and you do your calculations. When the table is ready you place your next bet. This toing and froing of chips continues all evening but gradually your pile of chips increases. At the end of the nights play it is obvious from the chips stacked in front of you that you have made a substantial profit.

Is what I descibe above possible? Can we, by using a system, win consistently at roulette? One thing is certain. Winning money at a slow rate, by means of a system, is far more likely than winning large amounts of money in a short space of time. You may be able to achieve it once, but I defy you to do it consistently.

What about other forms of gambling. Could we win money at say horse racing, the football pools or greyhound racing? On the evidence we have to study so far we could safely say a system cannot be devised. The evidence is all around us in the form of betting shops and casinos. If it was easy to devise a winning system these establishments would be a dying breed.

That is not to say we cannot try. I do not believe anybody can say, with any authority, that such a system cannot be devised. All we have to do is to find it. And with the help of our trusty micros our task is made easier than the same task that faced others in years gone by.

It's Logical Captain

As we are going to approach this in a logical way we ought to be sure of what exactly we are trying to do. We should also define our problem so that we do not get drawn off onto tangents at a later stage. Our objective is easy to define. We are tring to make a profit from gambling. Is that enough though? What if we make one pound profit but to do that we have to stand in a betting shop four afternoons a week. Have we achieved our objective? The answer is yes but it is hardly a worthwhile occupation is it?

Before you start then, you should be clear in your mind what you want to achieve from the exercise. Is money your main motive or are you interested in computerised gambling purely as a form of recreation?

Perhaps more importantly we should be clear of what the problem is. Put simply it is one of selection. Whether we are picking horses, greyhounds, football teams or roulette numbers it all boils down to the same thing. Which one should we choose? If we are lucky enough to pick the correct one(s) we will make a profit. If our choices are wrong we will lose money.

Just for Money

For the purpose of these articles the objective will be to show a profit, however small, but almost as important, is to show you how systems can be developed. The programs featured will be systems in their own right but will have a lot of potential to be developed further. In fact I will not pretend that I will have thought of every aspect of every sport we cover. It therefore goes without saying that with some modification one of the programs that I have written may be your starting point to making your fortune. If this turns out to be the case it also goes without saying that I am sure you will want to share your new found riches with me.

Most of the systems described will have one function. That is to select a bet in such a way as to minimise our risk of losing. Notice we are not necessarily trying to win but merely trying not to lose. If we can minimise our chances of losing to such an extent that we are guaranteed to win then so much the better, though in reality you will find this very difficult, if not impossible, to do.

Our problem then is what to select and our objective is to show a profit. Now we know our starting point let us take a look at some subsidary problems that face us.

Getting the Edge

Betting establishments, whether they be bookmakers or casinos, are a business. And as such their prime objective is to make money. As you might suspect this aspect of their business is not left to chance. No business can expect to remain soluble if it did not expect to take enough money each week to meet their overheads. How then, does a betting establishment ensure it makes money? Quite simply it fixes the books so that whatever happens it will make a profit.

A bookmaker will not profit on every race but the underlying trend is there, so that over a period of time the odds are so much in the bookmakers favour that he/she will eventually make a profit.

This advantage the bookmaker builds into his book is sometimes known as the edge. In a casino it is known as the house edge.

This is how it works, in its simplest form. If you bet at a greyhound meeting you will invariably bet on the tote. This means that you make your selection and your money, along with everybody elses, goes into a pool. When the outcome of the race is known the pool of money is divided up amongst the people who bet on the winning combination of dogs.

However before the money is divided, the organiser of the tote skims off a percentage and tucks this money safely in his back pocket away from the punters.

You can see from this sort of edge that the tote is guaranteed to win. This is not always the case though as we shall discover as we look at individual sports.

Before we even decide to bet we should always know what sort of edge is operating against us. Only when we know that can we decide if betting on that particular event is a worthwhile investment. Only once we have satisfied ourselves that it is can we start to consider our selection formula. *"Our what"* I hear you cry in unison. Our selection formula. Or to put it another way a formula we apply to the gamble in question which will give us the selections on which to place our money.

Send in the Beeb

This is where our computer comes in. By devising suitable formulas we can readily test them on a simulation which we have programmed into our micro. However before we sit down and start programming we

should be aware of the stages we need to go through. The stages are Design Test Review Amend

Design

The design of our system falls into two stages. Firstly we must design our basic system against which we will apply our selection formula. If we were trying to develop a system to simulate roulette this part of the system would be designed to play the part of the casino. We would expect it to spin the wheel, take bets, pay out wins and collect money that has been lost. We should also consider at this stage of our design if we require any statistics to be collected. If so, how will they be made up? For example we might want a breakdown of all the numbers that came up. Or maybe we want to know the proportion of reds that came up in relation to blacks.

All these points should be considered in our initial design stage. Do not allow yourself to gloss over this initial stage. You will be well rewarded for the effort you put in at this early stage. The initial design will almost certainly change as the project progresses.

The second part of our design is concerned with the selection formula. This will form the part of the program which is going to win or lose you money. As well as being called a selection formula it could, with some justification, be called the system part of the program. It's important to have the selection formula as a separate module from the rest of your program. The reason is two fold. Firstly it will make the module easier to refine. Secondly at some point you will want to dispose of it. This may be because the selection formula does not work or maybe you want to exchange it for a different module to see how they compare against each other. Having said all that it is extremely difficult to design a basic system which can accept all sorts of different selection formula modules. That must be our objective though. If nothing else it makes us think through the problem and this process will hopefully highlight some of the problems we have yet to encounter.

Now we have the program designed we can set about writing it. This is a subject to which many books have been devoted to and is therefore way outside the scope of this article. Suffice to say that if your design has been thorough enough then your program should already be broken down into a series of modules.

Program written, we can now set about testing it. When testing we must consider where we are going to get our test data from. In the case of something like roulette we can easily generate a random number between 0 and 36 which will admirably serve as a roulette wheel. By taking this approach we can easily run many weeks of testing in a matter of hours. This is obviously beneficial as it means we can eliminate bad selection formula very quickly and build on promising ones just as quickly.

Something like horse racing poses us a different problem. During our tests we cannot just generate a random number to select the winner. Unlike roulette, horse racing has many influences which can affect the result. Therefore when we are testing a horse racing system we must compare our selection formula against the actual outcome of the race. Because we have to test our system against actual results our test data has got to come from actual races. Unless you collect data from already run races your test period will last as long as the races take to run. Once our tests have been conducted we should then carry out a review. This review should look at various aspects, not least of all, is whether we have made a profit. It is no good though if we have not made enough money in relation to the time we have put in. We might have a winning system but if we only make 25p an hour then it can hardly be considered practical. We should also consider whether we can actually use the system. The system we have developed may well make money but if it involves a lot of complex calculations we must ask ourselves if we could cope with it in a live situation. As an example, a roulette wheel is spun about every two minutes. In that time you may have to carry out several calculations and then place your bet. Your system is useless if you cannot do these things within the time available between each spin. Once our system has been reviewed we need to amend it. This can take many forms ranging from scrapping the system altogether to deciding how we could amend it to make it work in a live situation.

In the next issue we shall begin to think about how we can develop a roulette system. I am not guaranteeing to make you rich but it will be fun trying.

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Robin Burton

6502-GO!

We'll be covering two main techniques this month, both concerned with executing machine code routines from within BASIC programs

The Calls

To call machine code from BASIC two instructions are provided, 'CALL' and 'USR'. Each offers different facilities so we'll look at the in more detail later, but for now it's enough to say they are both methods of treating a machine code routine as an extension of a BASIC program. As far as the section of machine code itself is concerned, remember that it must end with an 'RTS' so as to return control to the calling program, (assuming that's what's wanted).

There's a good deal of conceptual similarity between machine code and BASIC's procedures and subroutines. In essence the purpose of them all is to provide a more or less self contained process which is available to the main program from any, or at least several points within it.

In pricinple there are similarities, but in practice there are major differences. The first concerns why you might use machine code at all, and the obvious answer is code size and speed of execution. Alright, so it's quicker, but just how quick, and does it save much space? Any meaningful answer needs a yardstick, so rather than just quoting figures we'll find out shortly, by running a comparative test.

The second difference concerns data needed in both the main program and the called code. This isn't always required, but when it is the data must be presented in a certain way, because as noted last month, BASIC variables are dynamic and can't be used by name in machine code. This means different methods apply when you want to pass data back and forth. Another facet of this is temporary storage in machine code, for example for counters, flags and so on. In BASIC you simply create variables, but in machine code you must use specific memory addresses.

The final difference concerns where the machine code is loaded. BASIC routines are normally within the main program or, like overlays, direct replacements for a part of it. Loading a BASIC program allocates the memory and automatically takes care of where to store the code. This isn't so for machine code, it isn't part of the BASIC program, so it must be loaded separately, and it needs thought about where to load it.

The next step is to look in more detail at the first two points. The last one depends on what you're doing, how you're doing it and the machine configuration. In other words that one's your problem.

Execution Speed

It's difficult to compare execution speeds directly, because machine code is byte or bit based, and BASIC isn't, but if you don't have a feel for the real difference between the two, or you're unconvinced that it's worthwhile, try these two short routines.

They're not clever, which for comparison is ideal. They both move 256 bytes to another location 256 times, the equivalent of moving 65,536 bytes. Notice that to be generous to BASIC the example uses the fastest loop, FOR...NEXT, a comma in line 50 saves a second NEXT statement and integer variables are used. The machine code version was written with no optimisation, the method is simply the most obvious.

Here's the first, in BASIC.

```
10 TIME = 0
20 FOR I% = 0 TO 255
30 FOR B% = 0 TO 255
40 B%?&4000 = B%?&5000
50 NEXT,
60 PRINT "Finished in ";TIME/100;"
   secs."
```

Enter and run it, noting the time. Just so you don't think there's anything wrong I'll give you some help. You might just have enough time to make a cup of coffee before it finishes if you're quick. Now try this version, which does exactly the same, but in machine code.

```
10 from = &70
20 to = &72
30 ?from = 0:?(from+1) = &50
50 ?to = 0:?(to+1) = &40
70 P% = &3000
80 [
90 OPT 3
100 LDX #0
110 LDY #0
120 .move LDA (from),Y
130 STA (to),Y
140 INY
150 BNE move
160 DEX
170 BNE move
180 RTS
190 ]
200 TIME=0
210 CALL &3000
220 PRINT "Finished in ";TIME/100;"
    secs."
```

I won't encourage cheating, so if you want to know how fast these two are you must key them in and try them. I will say that if you've never tried such a direct comparison you might be surprised, but you won't be disappointed. By the way, did you notice the single pass assembly?

Of course it's no surprise that BASIC is slower and larger, but the surprise may be how much. It's interesting to note that if you fully optimise the BASIC version, putting it all on one line and omitting the time statements and all the spaces you'll shave about three seconds off the run time and it still occupies 46 bytes, while the machine code by comparison occupies only 15.

Remember when you consider machine code instead of BASIC though, that some operations don't depend on code for their speed. If a routine reads or writes disc, serial port or printer data, for example, the peripheral probably will be the limiting factor. In these cases BASIC is usually quick enough, so machine code may save memory, but not time.

Passing Variables

You'll notice that I used 'CALL' in line 210, but it could just as well have been 'USR'. Both must be accompanied by the address of the called code, but 'CALL' can also take parameters, though none were needed in our example.

A convenience provided by both of these statements is that if single byte parameters are required, an automatic facility is available. On entry to any routine the 6502's registers, A, X, Y (and C, the carry flag in the processor's status register) are set to initial values according to the contents of BASIC's integer variables, A%, X%, Y%, (and C%) respectively. Obviously the processor registers are a single byte, while the integer variables aren't, so remember that truncation will occur for values greater than 255.

For example, if A% contains decimal 65 (&41) when the 'CALL' or 'USR' statement is issued, register A in the 6502 will be set to &41 for you. If the value in A%, was greater than decimal 255 (&FF) the value passed would be the least significant byte, the equivalent of "A% MOD 256". X%, Y% and their equivalent registers operate similarly. This means that up to three single bytes can be passed across very easily, but remember to store the A,X and Y values somewhere before you change them.

C% is different. Because the carry flag is a single bit in register P, only the least siginificant bit of C% is transferred. This is equivalent to "C% MOD 2". This is more limited, but it can nevertheless be used to transfer conditions. You could for example arrive at a 'Yes/No' situation in your BASIC program, and if the condition was properly set in C% it could then control the action in the called code too.

As an example, suppose we wanted to store the values held in A%, X% and Y% in memory at the start of our machine code routine and then conditionally execute one of two optional routines, decided by the contents of C%. Omitting the assembler directives for shortness, here's the outline of such a routine.

```
 90 .start
100 STA &70
110 TXA
120 STA &71
130 TYA
140 STA &72
150 BCS routine2
160 .routine1
170 routine1 code here
180 ......
400 RTS
410 .routine2
420 routine2 code here
430 ......
650 RTS
```

In this case the values in A, X and Y are stored at &70 to &72 before anything else happens, but this is optional, we could have tested the carry flag, as in line 150, immediately. Of course if you have instructions prior to the carry flag test make sure that they don't affect its setting, or alternatively store the value of register P first. You will also no doubt have realised that you could have used BASIC's indirection to store these values before the machine code was called, but that would be slower.

The Carry Flag

If you use C% to pass conditions from BASIC there's an important point to bear in mind. It's common to use 'TRUE' or 'FALSE' as BASIC conditions, and while 0 is the only value which is 'FALSE', remember that any other value is acceptable as 'TRUE'.

This means that the 'TRUE' in BASIC can be an odd or an even number and there's no problem. However, when machine code is called the carry flag won't be set if C% is 'TRUE', but even. In other words, BASIC's 'TRUE' condition can't be relied on to set the carry flag correctly – you must ensure that C% contains a suitable value. All even values clear the carry flag, odd values set it, so 'TRUE' doesn't necessarily mean carry set. Remember this inconsistency if you're to avoid ripping your hair out in frustration over a routine that 'looks as if it should work', but doesn't.

If this point isn't too clear, you can easily test it yourself. Try this little program and you'll see the difference.

```
10 FOR C% = 1 TO 2
20 IF C% PRINT "TRUE" ELSE
     PRINT "FALSE"
30 IF C% MOD 2 PRINT "TRUE"
     ELSE PRINT "FALSE"
40 NEXT
```

'USR' also provides an additional automatic facility, that of passing the final values of A, X, Y and P back to the BASIC program. This is why the format of the call is:–

```
result = USR address
```

where 'address' is the call address of the code and result is a numeric variable which will receive a four digit hex number representing four processor registers when the call ends. An example will make things clear. We'll use osbyte &86 which returns the current line and character position of the cursor in X and Y. The osbyte call address is &FFF4, and the call number is &86, which must be in register A. No other parameters are required, so the BASIC commands are:–

```
A% = &86
result% = USR(&FFF4)
PRINT ~result%
```

You will see an eight character result, representing the contents of registers P, Y, X and A. I've just tried this and result% contained &B1140086. Taking the four values from the left here's what they mean. &B1 was the value in register P, and not very useful in this case. &14, was the value in register Y, the cursor's screen line, &00 was the character position in the line (pressing RETURN caused a new line) taken from X, and &86 is the (unchanged in this case) value from A.

We used an osbyte call for convenience, but any routine, including your own can be accessed in this way. Remember, you don't set up the values to be returned from the routine, this is automatic when 'USR' is used.

Obviously in a real program the four values can be extracted individually, and provide an easy means to return single bytes from machine code to a BASIC program. The easiest way to extract them is by using a mask and scaling, so to extract the value of Y from result%, for example, the statement:–

```
Y% = (result% AND &FF0000)
   DIV 256 ↑ 2
```

will do the trick. Notice that the position of the &FF and the power of 256 used both relate directly to the position of the particular register to be extracted from the result, since the objective is to exclude the other bytes.

If necessary you can also obtain the settings of individual processor flags to check status conditions too, by using the value from register P and binary arithmetic. To extract the status of a flag from result% you first need to know the internal bit layout of register P.

Some of the flags are irrelevant in BASIC, their settings can be meaningful only in machine code. Of the 7 flags only N, V, Z and C have any conceivable meaning when you're in BASIC, and probably most of the time you won't need any of them, but for completeness here's register P's layout.

Bit 7, labelled 'N' is the negative flag, set when the seventh bit in a result (A, X, Y or memory) is set. Bit 6 is the overflow flag, set when the result of arithmetic in the accumulator exceeds 255 (overflows). Bit five isn't used, bit 4 is the break flag, bit 3 is the decimal flag and bit 2 is the interrupt status. Bit 1 is the zero flag, set when an instruction gives a result of zero, and bit 0 is the carry flag, set as a result of addition or subtraction in the accumulator, or by logical shifts or rotations of the accumulator or memory.

To extract the setting of one of these flags the arithmetic is more complicated and the explanation even worse. The complication is that the negative flag, N, can make the whole result appear as a negative when it isn't, so conventional arithmetic doesn't work. To save a long winded explanation, just treat the whole result as a 32 bit number (because we're extracting bits, not bytes this time) and scale it. For example, to isolate the carry flag the statement would be:–

```
C% = (result% AND &1000000)
   DIV 256 ↑ 3
```

To extract any flag, the 'AND' value starts with the binary value shown in the status register layout, hence the 1 in this example. If the carry bit was set C% will give 'TRUE', if not C% will give 'FALSE'.

More Parameters

'USR' is fine for single bytes and simple conditions, but you'll sometimes want to pass larger quantities of data to or from your machine code. In this case 'CALL' is the choice, because it allows parameters to be

included.

This is achieved by following the 'CALL' statement with the required BASIC variables, separated by commas. For example to call code at &4000, passing the variables B%, data and name$, the command would be:–

```
CALL &4000,B%,data,name$
```

Information about the location of the variables is placed by BASIC in a parameter block in page 6, (&600) and your machine code can retrieve this to access the data. Address &600 always contains the total number of parameters, and starting at &601, each parameter is described in three bytes, in the form:–

```
bytes 1 and 2"start address (high byte
    – low byte)
byte 3""data type
```

Permitted parameters, and their types are:–

```
0  a byte – eg ?memory–address
4  a 32 bit integer – eg B% or
     !memory–address
5  a 40 bit floating point variable –
     eg data
128  a string, in memory, terminated
     by &D – eg $text
129  a string variable – eg A$
```

Note that although 'CALL' allows numerous parameters of various types and on entry the 6502 registers are set up exactly as for 'USR', no values are returned automatically.

If you want to pass results back to BASIC you must do it yourself. This means storing data at specified locations and retrieving them when you're back in BASIC. Use the same variables as the 'CALL' did by all means, but remember that neither the type nor the size (for string variables) can be altered. If you need different data types or sizes you must use another location and retrieve the data by indirection.

Clearly certain operations are more awkward because of this, and only you can decide if it's worthwhile for your application.

Zero Page

Notice that in the speed comparison I used zero page locations &70 to &73 to hold the two addresses, without concerning myself about the previous contents. This is because BASIC is the current laguage, and &00 to &8F (plus, incidentally all of &400 to &7FF inclusive) is always the property of the current language. Fortunately BASIC is unusually generous, and it leaves &70 to &8F for anyone to use. These locations, therefore, are always public property in BASIC, and you can quite legitimately use them for scratch workspace as you please.

What you can't do is to store something there expecting it still to be intact the next time you look, it may not be. Remember the area is public, which means it does not belong exclusively to you. In addition, this generosity by BASIC does not extend to other languages, so if your routines are expected to run with any other language you must not corrupt this area.

Zero page is vital in machine code, since many addressing modes are possible only through zero page locations. Luckily there are a couple of other zero page areas which you can use, so long as you're careful about it. &90 to &9F is reserved for Econet, so this is usable, unless you write programs which might be run on a network. &A8 to &AF is operating system scratch space, so you can use these bytes so long as there's no need for an OS call while you do so. There are one or two others, and they are all adequately documented in the books suggested at the beginning of the series.

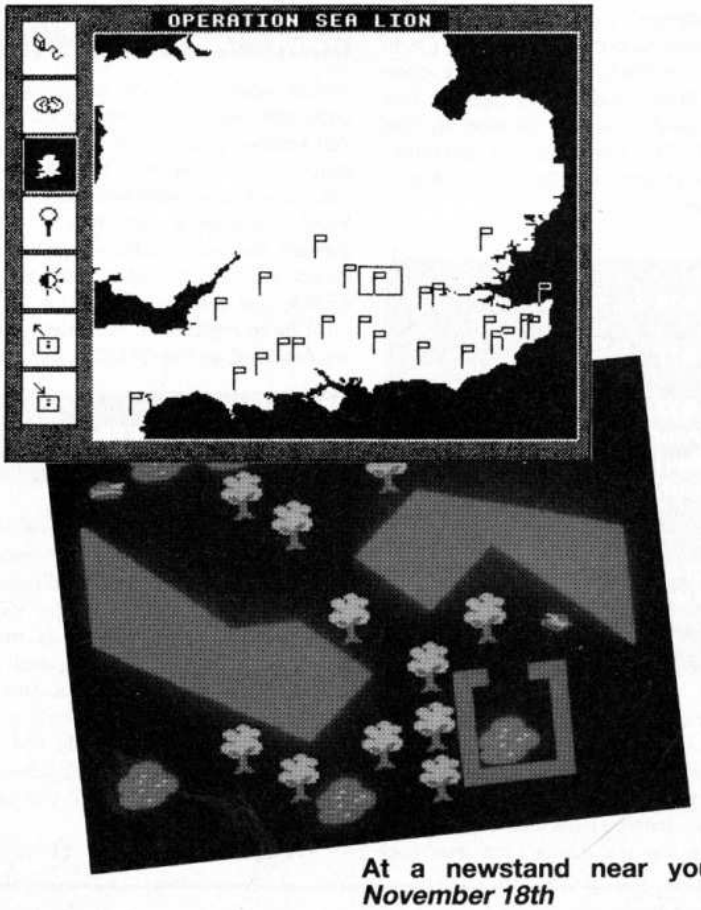
You won't need this technique often, but if you write code for an unknown environment, the situation, for example, when you write commercial ROM software, extreme care is needed. You can't assume anything, if you want to be 'legal' and compatible, so you must leave all user memory exactly as you found it. In such cases you must store any zero page bytes you want on the stack as you enter the routine, putting them all back on completion immediately before your final exit.

Next Month:

Next month things get more serious, as we move from called routines to stand-alone programs. We'll be examining vectors and how to intercept them in programs which run independantly, giving as it were, a "background" capability.

disk USER

Disk User Games Special



The Big names are in Disk User.

Peter Scott Author of *Omega Orb, Thunderstruck II* and Last of the Free, among others is telling **all** in Disk User this month

Matthew Atkinson author of *Repton 2* and *3* has written **Operation Sea Lion** – with a suberb graphical interface! The game is a suberb simulation of what would have happened if Adolf Hitler *had* invaded.

Also...

- *Quest* – over 240 locations to explore in our machine code adventure game.
- *Rumble..... Rumble.* A four-player tank game for out and out maniacs.
- *Maelstrom* . Not just a mindless shoot-em-up, but a totally mindless one at that. What's more, you could build one like it. How? You'll find out in the mag!

At a newstand near you from *November 18th*

COMMUNICATE

The Micronet storm abates, and the world of comms goes ever on

The Right To Reply

October's installment of Communicate! certainly caused a stir amongst readers, Micronet subscribers and the management of said organisation.

I would like to thank all of you who mailboxed me, and those of you who I met at the PC show and at the A&B/Watford Electronics open day for your kind comments with regard to the article.

Being a democratic bunch here at A&B we invited Telemap to reply to my comments, and they have. Presented in full is the reply from *Michael Weatherseed*, the new General Manager for Telemap Group.

To get an idea of Mr Weatherseed's position lets look at the management structure of Telemap.

Telemap's MD *John Tomany* is a Dialcom import who has moved up a rung or two on the ladder of importance. *Felicity Thorp*, product manager for Micronet and another BT import has moved on elsewhere – who knows where. *Francis Jago*, the one time Managing Editor of Micronet could best be described as a passing ship in the dark, and one that carried poisonous waste. He only lasted a few months and has left the company to do something with Apple Macs. I do not think he will be missed by many.

Paul Needs, former deputy-dawg is now the head prefect, and if anyone deserved to be promoted to the position of Editor then it is Paul. Known by many Netters from his days when he used to play bass guitar (snigger) and was just an ordinary subscriber, Paul knows what the punters want. Lets hope he's in a position to deliver the goods.

And then there is *Michael Weatherseed*. This gent comes from a comms-related background where he used to play a part in viewdata systems for travel agents and such like. It is good that he knows how to key hash, but does he know what the subscribers want?

I had the opportunity of talking to Michael shortly after he joined Telemap. I learned two things from my meeting; firstly, Micronet is not a "product" but a service, and secondly, according to Mr Weatherseed "the customer is king."

Yes, I know that's got to be one of the most well-worn cliches but he has said it so many times since he joined the company he just might mean it. Only time will tell.

As for the reply from Telemap I leave it to you, dear reader, to come to your own conclusions. However, I would like to point out that it's the first time that Telemap has admitted to me that they have made a mistake.

Shades Of Gold

Shades, the popular multi-user adventure game can now be played by anyone on Telecom Gold.

Shades has grown in popularity since its launch on Micronet a couple of years ago. First it was available for Micronet subscribers only, then Prestel users could have a go. A scrolling version of the the game was made available to Prestel/Micronet subscribers soon after that.

Telemap's 0898 service FunTel (formerly Hotel California) has as its primary feature, Shades which can be played by anyone – you don't need a subscription. However, at 25p per minute off-peak you've got to be nuts to play it for long!

Playing Shades on Gold couldn't be easier, simply entering SHADES at the chevron '>' will present you with a menu. You can go straight into the game, or look at the instructions which I would recommend you do as it's a complex beast!

During peak hours (8AM – 7PM) the cost of playing Shades will be absorbed in the peak rate time charge. During the off-peak period the charge is 4.5p over the normal rate (depending what system you are on). However, the normal Telecom Gold data charge is also applicable and this can significantly add to the cost.

MicroLink subscribers need not worry about the data charge as it's not applicable to system 72. Indeed, Shades is operated by Telemap which is a rival to MicroLink, yet for some time, a promo banner alerting MicroLink subscribers to the Shades service has been displayed as part of the MicroLink log-on process which is quite sporting of Database Publications, the company that operates MicroLink.

Have Suit Will Travel

Did you enjoy the PC show? I did! I got drunk with fellow A&B brothers Clive and Darrin on several occasions c/o some sporting PR suits. (actually *we* propped you up from bar to bar whilst *we* got on with the work – Ed).

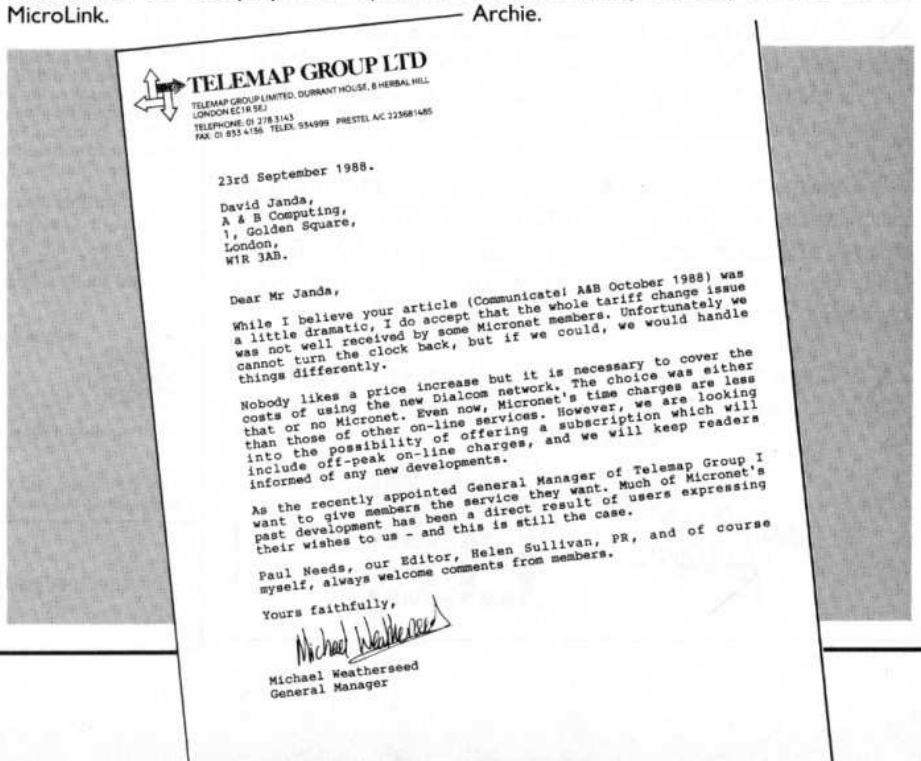
From a punters' point of view I can understand why many were not so happy with the event. The comms side of things was pretty quiet, but what was on show was interesting.

Pace, the people who gave us the Nightingale modem have released a new line in the Linnet range. The Linnet 2400 series and the Linnet 1200 are fairly expensive, but Pace put the cost down to the fact that they do their own R&D. Why?

The item that caught my eye was Amstrad's free-standing high speed modem. The SM2400 costs £249 plus VAT, and for that you get all the speeds up to 2400 bps.

Modem Marketing were showing off *Deputy*, the low-cost Archie comms package. We've got a review copy of that as well as Beebug's *Hearsey* and will bring you reviews of both products in due course.

Micron.. er sorry, *Telemap* were at the show and, my, what a difference! The stand reflected their new business image with a couple of PCs being used to demonstrate InterBusiness and such like. The suits were out in force with clipboards noting down names and such like, and Telemap even resorted to employing a girl to walk about the show dishing out entry forms to win an Archie.



TELEMAP GROUP LTD

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LONDON EC1R 5EJ
TELEPHONE: 01 278 3143
FAX: 01 833 4156 TELEX: 934999 PRESTEL A/C 225681485

23rd September 1988.

David Janda,
A & B Computing,
1, Golden Square,
London,
W1R 3AB.

Dear Mr Janda,

While I believe your article (Communicate! A&B October 1988) was a little dramatic, I do accept that the whole tariff change issue was not well received by some Micronet members. Unfortunately we cannot turn the clock back, but if we could, we would handle things differently.

Nobody likes a price increase but it is necessary to cover the costs of using the new Dialcom network. The choice was either that or no Micronet. Even now, Micronet's time charges are less than those of other on-line services. However, we are looking into the possibility of offering a subscription which will include off-peak on-line charges, and we will keep readers informed of any new developments.

As the recently appointed General Manager of Telemap Group I want to give members the service they want. Much of Micronet's past development has been a direct result of users expressing their wishes to us - and this is still the case.

Paul Needs, our Editor, Helen Sullivan, PR, and of course myself, always welcome comments from members.

Yours faithfully,

Michael Weatherseed

Michael Weatherseed
General Manager

According to several reports, a bunch of Shades players arranged to meet at the stand on the Saturday of the show. *Apparently* they were asked to move on after a while. Another incident involved a Micronet Sub-IP who, in his own words was made to feel unwelcome.

In the past there have been numerous gatherings at the Micronet stand without any problems. Could the "new image" have something to do with the change of attitude towards these Netters? I believe so!

Callum Macfarlane, used to edit a gallery on Micronet called *View from the Trenches*. Updated on a daily basis he kept all informed of the Prestel/Micronet tariff charges, access troubles and such like.

Callum turned up to the show with numerous stickers protesting about the time charges and such like (see illustration!). He turned up to the Net stand, and the sticker he was wearing was removed from his lapel by a Telemap employee – that's bad.

Still, there were a couple of Micronet "meets" that evening and plenty of stickers were in abundance there – nice one Cal. Alas due to high phone bills and a dubious Prestel bill Callum is no longer on the system, he'll be missed.

Here Are The Fax

Now and then a particular topic becomes very fashionable in the computer world. Currently it's fax (facimile transmission).

Basically, fax enables one person to transmit receive documents over the telephone line. It's also easy to use; a bit lie a photo copier. The ability to transmit and receive documents consisting of text and pictures is very handy, and during the recent postal dispute fax usage rocketed.

It's relatively easy to use a computer as a fax machine, and Archie users will no doubt be aware of Computer Concepts interest in this field. However, this involves investing in hardware and software, and although cheaper than a stand alone fax machine the cost is still high.

Fear not, there is a cheaper solution! On-line databases are now cashing in on fax. One-to-One has offered a fax service for some time, and Telecom Gold now has a text to fax service.

This enables a Telecom Gold subscriber to upload, or enter on-line text and send it to any fax machine. This is just the start though. TG hope to offer a fax to text service that will enable a fax user to send a (text only) document to an individual's mailbox. The final stage will be fax to TG with graphics as well as text.

Down To Business

By the time you read this Telemap, the outfit that runs Micronet on the Prestel database may have launched their latest value added service (VAR) InterBusiness.

Billed as an information and advice service for the businessman who needs to be informed on everything from raising capital to managing employees, the service is completely split off from Micronet.

Subjects covered will include tax, finance, sales and marketing and such like. Users will be able to log-on and ask questions (in confidence if necessary) and have them answered by a team of experts.

How much the service will cost is not known at the time of writing, neither is the question wether the service will be operated on a subscription basis.

What is known is that the business advice that is offered as part of Micronets Money Xtra (Bizznet) will be transferred to Inter-Business. This will mean that yet another feature of Micronet will disappear. Of course, Micronet subscribers could always use the new InterBusiness service, but if that means charging them for something that was free in the first place then that's wrong.

InterBusiness is by no means the first of its type. MicroLink has operated Expert Link since April, and it's free of charge. Expert Link (EL at the chevron) provides a number of catagories ranging from computing to legal matters. Users can either send in questions on the BB within Expert Link, or if the query is confidential then they can post their question to a mailbox and have the answer sent to their mailbox.

The service is operated by *Gabriel Jacobs* and *Dave Oborne* of the University College of Swansea, and the questions are answered by a team of lecturers.

A personal legal and financial advisory service is also available on MicroLink (LF at the chevron). Provided by Insight, the service costs from £10 to £20 per annum and questions are answered within 24 hours.

G2 Systems: 5 Mead Lane, Farnham, Surrey GU9 7DY
Telephone: (0252) 712525

CHROMA 300 SERIES -genlock system for BBC Micro's

The Chroma 300 Series is a genlock and video overlay system for the BBC Micro range, including the Archimedes. It enables the output of the computer to be superimposed, in colour, on a PAL video signal from a video recorder or camera for less than £300 (ex VAT).

G2 Systems is the U.K. specialist in interfacing computers to video equipment. We offer a wide range of hardware such as genlocks and RGB to PAL coders plus video software for captioning, painting, prompting etc.

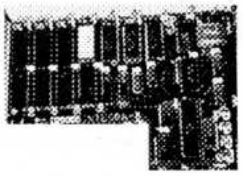
If you want professional advice about anything to do with video and the BBC micro give us a ring on
0252 712525

Computer Solutions for Video

G2 SYSTEMS

INTEGRA-β

The Expansion for the BBC Model B



The INTEGRA-β provides four operation modes - as standard Beeb or with shadow Ram and emulation of 'B+' and Master 128 features. Ideal for educational, commercial and data collection applications, as well as the private user.

An included battery-backup system, (which covers all fitted Ram), can save any data in Ram during a power-line disturbance or when the computer is switched off. Also, Rom images can be loaded from disc, stored and cleared at will, minimising the need for physical Rom changes. Compatible with DFS, ADFS and second processors conforming to ACORN® protocols.

Enjoy the facilities offered by the INTEGRA Operating System which allows you to run Model 'B+' versions of programmes with their added features also provides many of the features otherwise only available in the Master series. Control of sideways Ram even exceeds that available in the Master. Includes comprehensive machine configuration means, real-time clock with date, calendar and alarm features and commands for controlling the working environment. Will additionally allow use of the type 65C02 processor with it's enhanced instruction set.

Compatible with many applications, some of which are,
Inter-Word, Inter-Sheet, Inter-Base , Wordwise Plus from Computer Concepts. View-Sheet, View 3 from Acornsoft. AMX Super-Art, AMX Stop Press! from Advanced Memory Systems. The Publisher and Genie from Permanent Memory Systems. Music 5000 System and Ample from Hybrid Technology.

OFFER PRICES

Item	UK (Including P&P,Ins. VAT)	EEC (Incl. P&P,Ins.)	Others (Plus P&P, Ins)
INTEGRA-β	£130.00	£122.00	£118.00
32K Ram Chip*	£13.34*	£12.00*	£12.00
Dual WP Switch§	£7.00§	£8.00§	£7.00
Extra Switch*	£1.50	£1.50*	&1.50
65C02 CPU*	£8.75*	£8.75*	£8.75
If ordering separately add as indicated for P&P			
*	£1.00	£2.00	
§	£2.50	£4.00	

The WP Switch has two switches fitted with room for four more. Each switch controls two 16Kbanks. Fits at rear of BBC casing and leads push-on to board pins.

COMPUTECH
The Garth, Hampsfell Road, Grange over Sands, Cumbria. LA11 6BG
Telephone: 044 84 4604

Jonathan Evans

ADVENTURE ROUNDUP

Adventures seem to be making a comeback for the Beeb – but the Archie and the Electron are bringing up the rear as well!

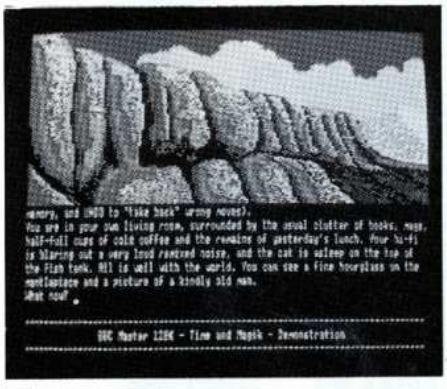
At last! Robico have got going again with *Blood of the Mutineers*, the first in a series of Captain Blizzard adventures to be released for the Electron (tape), BBC (tape and disc) and Archimedes machines – the latter with added graphics. I will be reporting on a pre-production review copy of the BBC version and giving news of future plans from what is now clearly established as the best software house for Acorn based adventurers. First, however, I have news of a "new" release of Level 9 games.

Time and Magik

Time and Magik is in fact a repackaged set of three old games of Level 9 Computing, but I suppose we should be pleased that they are at least showing interest in the BBC market once again. The games are distributed by Mandarin Software and presented as a 'trilogy' consisting of Lords of Time, Red Moon and The Price of Magik. In fact, Lords of Time was written separately, although the other two were conceived of as a series in their original presentation. A number of BBC owners may not have seen these games owing to Level 9's much criticised (in *this* column) policy of refusing to distribute disc versions of BBC games. The present programs come on an 80 track disc with data on both sides (flipped after the game loads) and are intended for the Master series, B plus or memory expanded model B – which must cover many current owners. The games have graphics – not present in the original tape releases – but you must have both shadow RAM and sideways RAM in order to see them. The games will run in text only mode if either one of these forms of memory expansion is present. The disc is not copy protected and you may make a backup copy. However, piracy protection is provided in that you must supply a word from the lengthy text in the booklet provided whenever you try to load a saved position from a game.

I reviewed both *Red Moon* and The *Price of Magik* quite some time ago in the magazine. In brief, I found these games of typically high Level 9 quality in terms of the puzzle construction, but rather less enjoyable than others of theirs such as the *Silicon Dream* trilogy. This is probably a matter of personal taste, since I have never been particularly keen on the use of magic in adventure games which I know that many other players do enjoy. Since *Lords of Time* had somehow escaped me previously, I decided to give this game a thorough try as a sample of this new package.

Before commenting on the game itself, I will first make some assessment of the technical presentation of the adventures. The graphics consists of pre-drawn screens which are loaded from disc and occupy the top half of the screen with the text scrolling underneath. By some ingenious device the picture can be scrolled off the screen revealing the text which previously disappeared beneath it. Apart from the graphics, however, it is not too clear how the games have been developed to take account of the disc access and expanded memory standard for which they are aimed. Level 9 games typically have rather short text descriptions – compared say with Robico games – and around 200 locations. Certainly, Lords of Time – which I played right through – fits this description with no obvious signs of expansion.



The theme of the game is time travel, via a special clock, with a total of nine levels to be visited in more or less sequential order. Each level is set in a different time and place and constitute generally self contained mini-adventures in which you must find an object vital to the final completion of the game plus some treasures which score points. The only real interaction between levels lies in the fact that objects found in one can be carried forward and used at a later level. I hoarded all mine in the clock to be on the safe side! I was disappointed with the game, whose text was sparse – even by Level 9 standards – and fairly dull, and whose quality of play and puzzles are well below the ingenious standard that we normally associate with Level 9 games. The game is, however, playable and will at least serve as a fairly easy introduction to adventuring for the more complex games that follow.

Blood of the Mutineers

Robico are now indisputably the number one software house for Acorn adventurers. In the past year or so, however, they have been concentrating on conversions – such as *Enthar 7* on the Archimedes, of which more below – and publication of games from outside authors such as *Village of Lost Souls* which is actually a re-release. They were well overdue for production of a brand new game and preferably one written by the O'Leary's themselves, for those customers (and re-viewers!) who loved the style of the original Rick Hanson games. I am delighted to say that just such a game exists which I have just played through in a pre-production BBC version which should be available by the time you read this. The game will actually be released also for the Electron (with reduced text but intact puzzles) and for the Archimedes (with added graphics). The Archimedes version will be published a little later but hopefully in time for Christmas 1988. The game itself is delightful and strongly recommended whichever machine you own.

Technically, the game is of the usual high Robico standards with an advanced parser and quick printing text despite the compression used. Although every byte is used on the BBC, the game has only 117 locations, as opposed to the 200 or so in most earlier Robico games. The reason is that they have put far more puzzles in so that one is solving problems almost constantly, with hardly a moment to take breath and enjoy the scenery. This is one of the most stressful as well as enjoyable adventure games that I have played for quite some time! The puzzles are hard but fair and fascinatingly complex and original in their construction. The contrast with the dull simple puzzles of Lords of Time

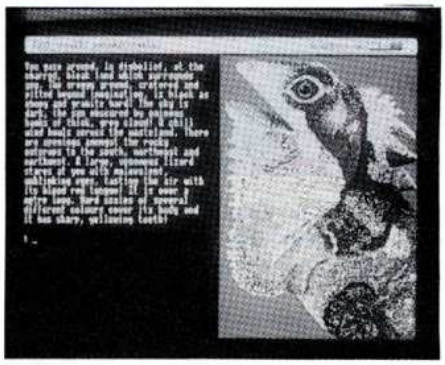
which I had played immediately beforehand was stark indeed.

Blizzard appears to be some kind of old time pirate captain. He starts the game on board his galleon with an imminent mutiny on his hands which can prove quickly fatal in a number of different ways. It is a Robico hallmark to have a very complex problem at the start of a game, although with a limited number of locations and objects available with which to solve it, thus making it possible with enough persistence. They have excelled themselves with the start to Blood of the Mutineers which is most elaborately constructed and very difficult (clue sheets will be available!). I particularly like the way in which the authors have anticipated almost everything you might try to do, including much that is irrelevant to the solution, so that the program always appears to be making an appropriate response. This conveys a strong feeling of realism which is lacking in so many adventures. Should you succeed in escaping the mutineers and making your way to land, then you will need to seek hidden treasure with the aid of a pirate map, always provided you can deal with several extremely tricky encounters with the island's wildlife. Great stuff!

Other news

My other news this month is mostly also of Robico. They have finally released their *Enthar 7* game for the Archimedes. The BBC version uses disc access and text compression to provide a huge game of around 450 locations with many fascinating puzzles. In my earlier reviews of this game, which has a sci-fi scenario, I have declared it to be quite simply the best adventure game ever released for the BBC micro. It has the quality of an epic novel of 1000 plus pages – the sort you enjoy so much that you want it to go on and on. Great news then for Archimedes owners that it is now available to them.

As featured a few months ago – Enthar Seven – Extended text, beautifully detailed graphics, to all intents a winner!



The good news about the Archimedes version is that it has extended text (already voluminous in the BBC version) and added graphics. Robico have decided on the use of a small number of very high quality pre-drawn pictures rather than lots of low grade pictures drawn by program commands. I think this is sensible, especially as the essence of good adventures will always lie primarily in the text anyway. The problem with this approach, however, is that the high resolution Archimedes screens take large amounts of memory to display and hence quickly fill up a disc. The bad news about Enthar 7 is that Robico have decided to run it under the 6502 emulator which means that the disc must be accessed on every command as in the BBC version. Whilst I find it understandable that Robico decided not to take on the massive recoding exercise required to produce a native Archimedes version, it is frustrating knowing that such a version could comfortably run from memory with lightning fast response. In spite of this and the hefty £29.95 price tag, there can only be one recommendation to an Archimedes owner with the faintest interest in adventure games: buy it!

Other news in brief: Robico's long awaited Western spoof, 'Blazing Star', should be out for Christmas in BBC and Electron versions. Ian Muriss (author of The Hunt) has taken over the programming now. Heyley Software have released their excellent Stranded! game, written with a modified version of Adventurescape, for the Archimedes. I understand it is virtually identical to the BBC version including the frequent disc access. This is less excusable than with Enthar 7 since the system runs in BASIC under the native Archimedes environment and it is quite easy to convert and Adventurescape game to run with all the text in memory if there is sufficient available. In fact, I published just such a utility in an earlier issue of the magazine. Heyley's next game, *Criminal Pursuits* is however to be a custom written Archimedes game whose publication is being discussed with Robico. That's all for now, folks.

COMPETITION

Competition Time!

To Celebrate the launch of Empire Strikes Back from Domark we've got Five Jedi-packs featuring copy of the film from CBS/Fox Video plus a Beeb version of the game Star Wars.

To win one one of these sets just answer these five questions from the A&B Rebel Training Manual along with that all important tie breaker.

1. **What is the name given to the creatures the rebels ride on the ice planet?**
2. **What is the name of the Ice Planet?**
3. **Who was Lukes tailgunner in the snowspeeder battle.**
4. **Who is the owner of Cloud City?**
5. **Which Bounty Hunter captured Han Solo?**

Tie Breaker

A Good title for the next Star Wars film would be...

.....

.....

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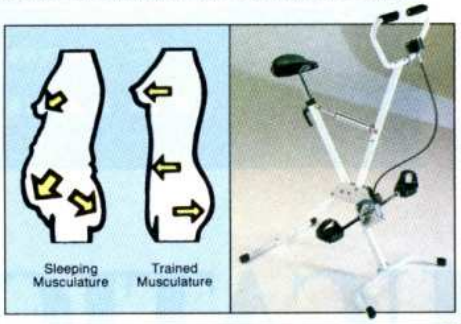

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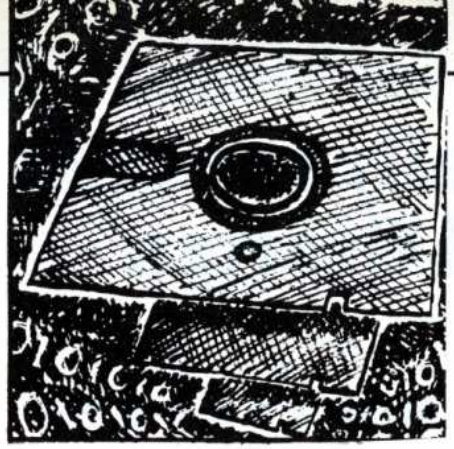
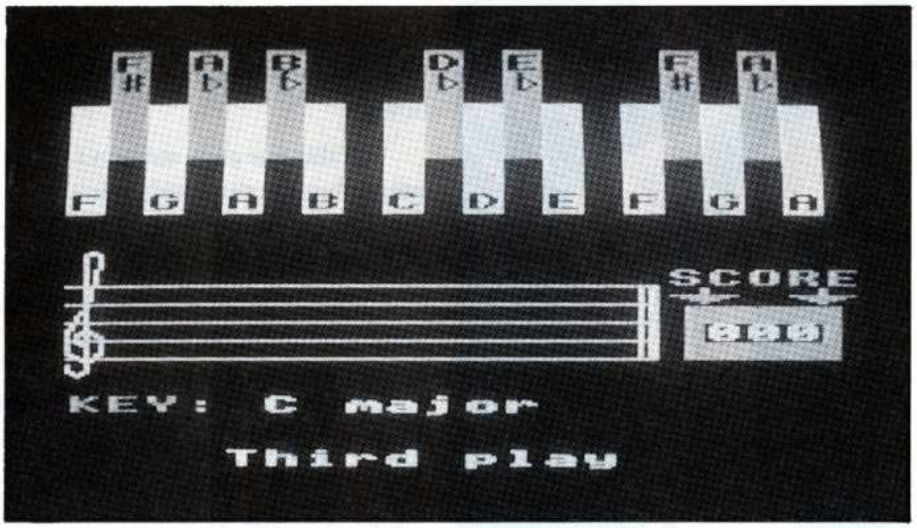
Elizabeth Wright



Liz Wright takes a good look at *three* educational software packages



EDUCATIONAL MUSIC 2

In The July issue of A&B Computing, I looked at computer software to help the pupil taking his (or her) RSM grades aural exams for the first time; I hinted then at the difficulty of integrating this software into the classroom and suggested that perhaps this software should be used by individuals, or for additional tutoring.

I have just received two packages – one of which deals with the aural exams again, but another that deals with the more intricate aspects of teaching music – the "nuts and bolts" of the language, so to speak.

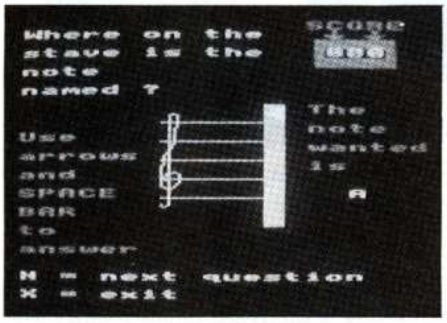
Can you read music?

Sadly, a great many people *cannot* read music, and this software package attempts to rectify the matter by taking the BBC Micro owner through a series of systematic tests. It takes the puil through (in a very rigid manner) the rudiments of music covering the notes on the stave and not and rest durations - it doesn't deal with sharps or flats or any second stage information such as bars.

The program sets questions in the chosen field and rewards correct answers with a point, and an incorrect answer with another try or an attempt at passing (in which case, the points are deducted).

To be honest I thought we left this scoring approach in educational software years ago – *you do not take away points from a score* especially if young children are likely to be using this software - the computer is supposed to be a friend and if it starts taking back scores children have rightfully earned, then, to be quite honest, the program isn't worth the time or effort learning how to use it!

A brief summary of the scores are displayed after twenty questions, and then the pupil can move on to another level.



There are three main categories of question, any or all of which can be selected at the start of the run together, with varying levels of difficulty within the options, ranging from note recognition (by displaying treble clef and the note with a fairly accurate tone beeping at the end) to note letters (for example, tabulature) with the answer being placed on the stave.

Note lengths are dealt with in a similar manner and take the form of how many notes does it take to make a note of *this* length? displaying a chunky, but eminently readable stave.

One nice feature is that the notes are not placed in any order, so should I have a pupil waiting outside, then the chances of him remembering the note lengths or sequences are limited, to say the least!

After trying out this software on a number of pupils, they were not happy – and quite clearly stated their opinions when being asked to follow the confusing screen display and the strange keyboard controls – in the end, I merely stepped through the questions and entered the answers for them – it was much quicker that way!

I objected to the scoring system – it reminds me of programs I call "driller killer" software, It drills in the concepts, and kills any enthusiasm for training children to play an instrument.

Buy it at your peril.

Play what I play

The title sounds a little more friendly I must admit, and it is an aural music practice package *"aimed at students of secondary and upper juniour school age"* whatever that means - some of my pupils are mature and according to this package do not fit into the category.

Anyway, the software tests relative pitch perception, memory and the ability to relate the notes heard, and to recognise notes visually represented in glockenspiel, keyboard, or a stave layout – again, quite chunky (either Mode 2 or Mode 5 – Ed).

In the normal manner of a standard "pitch" aural test, the computer names the key, plays the key chord, and plays a sequence of notes whose lengths are unvarying (and are not part of the test). The pupil then selects each note by a combination of the cursor key and the <Space Bar>, this is duly marked on the piano keyboard - quite a hard test and it really put some of my advanced pupils through their paces, of course there is a "pass" option which is good, and like the Perfect Fourth software I reviewed in July, if you don't get the answer right, the computer shows you the right answer before moving onto another level.

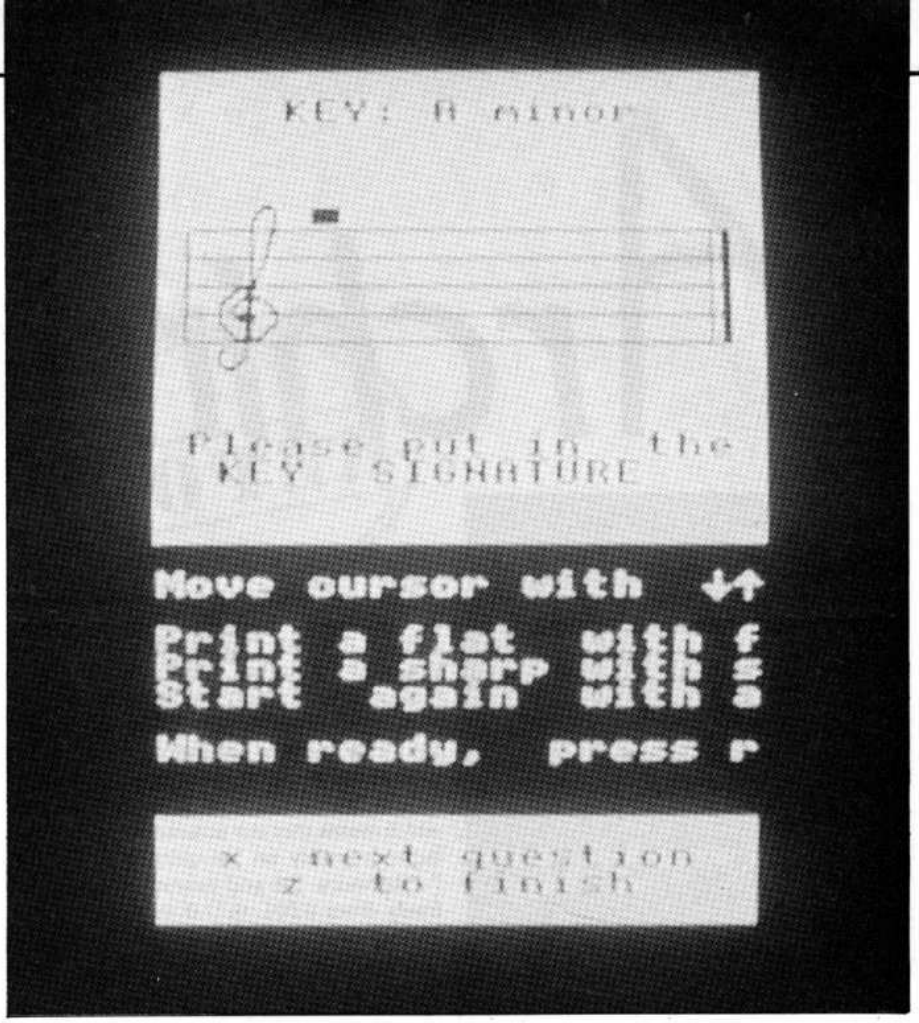
The annoying thing is that it employs the the same stupid points system – Ted Kirk, the author of this package should have had his head looked at when devising the points rating system (can I say that?) – (yes – Ed), for younger pupils, I just tell them that the score is just a special number for me, and not to worry about it, but sticky tape on the monitor will suffice for the older ones.

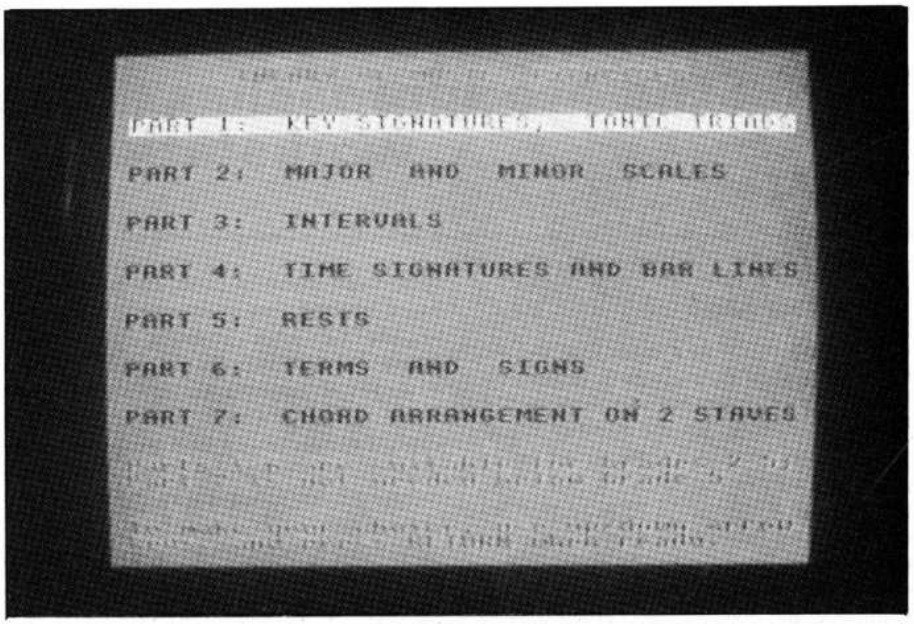
1000 points – a perfect score will get you a special display.

I agree with the manual whan it says that it is *"cheerfully presented and pleasant to use"*. Apart from my initial foybles, I think Perfect Fourth software may have some competition, but only at lower levels as Ted Kirk's software cannot really compete at higher grade levels.

I do, however, contest the manual's comments when they say that the package goes up to grade "5"; even taking into account the locally adjusted "O Level" grades (modified by the RSM), they are still woefully low, I teach children up to grade 3 with aural revision using chromatic major and minor exercises!

A nice package with a few annoying traits that could be ironed out please – namely the scoring system.




PART 2: MAJOR AND MINOR SCALES
PART 3: INTERVALS
PART 4: TIME SIGNATURES AND BAR LINES
PART 5: RESTS
PART 6: TERMS AND SIGNS
PART 7: CHORD ARRANGEMENT ON 2 STAVES

Theory of music

This is possibly the most adventurous of the three packages reviewed here in that it attempts to teach the pupil theory of music for the associated board examinations from grade 2 to grade 5.

These examinations teach pupils the "grammar" of the language of music. "Theory.." differs from the others by *testing* rather than instructing, it should be a good ruiler by which teachers can measure their pupil's progress, but I would rather add it to the lesson towards the end of a session, just to give the student a break and to "spice up" the odd dull lesson when the pupil has his mind on other things.

The package covers the rudiments of music, musical terms and the recognition of signs and, of course, the first steps in harmony in the traditional display of a two stave display and a root position chord (a necessity as the grade 5 requirements state that root chords should be considered the norm) - sadly ornaments are not dealt with.

There are seven sections to the complete package, and any teacher will recognise the rigid pattern it sticks to:

Pitch and Key
Key Signatures and Tonic Triads
Major Harmonic minor and Melodic minor scales
Intervals
Time
Time Signatures and Bar lines
RestsGeneral Tests on notation
Harmony

Complementing Triads?

After using the package for just a few weeks I noticed that this was by far the best package of the three – although *Play what I play* and *Can you play music* were both distinctly lower in quality and they were not very popular, however, the *Theory of music* package was very well received – in fact, this was the *only* decent package of the three.

Factfile

Contact **Ted Kirk Software at, 33 Humber Crescent, Sutton Leach, St Helens, Merseyside, WA9 4HD**.

Elizabeth Wright is a freelance teacher and has been teaching children Piano and Violin for the past twelve years.

Gordon Taylor

Archimedes REPORT

With its 32-bit processor and high-resolution screen displays, the Arc is very well suited to Computer Aided Design (CAD). One such application is the laying out of Printed Circuit Boards (PCBs). Silicon Vision have just released the first such package written originally for the Arc (where Lintrack was based on previous versions for the Model B/Master, and the IBM-PC and RM Nimbus). Both follow in the tradition of highly cost-effective PCB layout packages which run on the Model B/Master – including the original Lintrack, and Pineapple's PCB Designer. Although this is their first PCB package, Silicon Vision have extensive experience of PCB design, and the package is designed accordingly, to make best use of the Arc.

The first PCB layout package written originally for the Arc approaches those on available workstations

Setting Up

Arc-PCB is supplied on a floppy disc, and will run on all models of Archimedes. A batch file is provided, which sets the Screensize to 80K (or 160K for Mode 20), and all other "sizes" to zero, and "unplugs" certain modules to give the maximum capacity. Furthermore, the program is only about 53 K, so that the drawing data capacity is usually sufficient, even in a 305. Since the resolution is 0.001 in with a range of 32 in, it works with integer arithmetic, and does not need either a hardware Floating Point Unit or a software FP Emulator. It works in Mode 12 with standard monitor, and can use Mode 20 with a multi-frequency monitor. The latter are available in 12 in, 14 in, and even 20 in sizes – as used with workstations – though these last are much more expensive. Arc-PCB can be used with a single floppy drive, or a Winchester hard disc. Another batch file is provided to install it on a hard disc, but the programs contain encrypted serial numbers so that unauthorised copies are traceable.

Arc-PCB

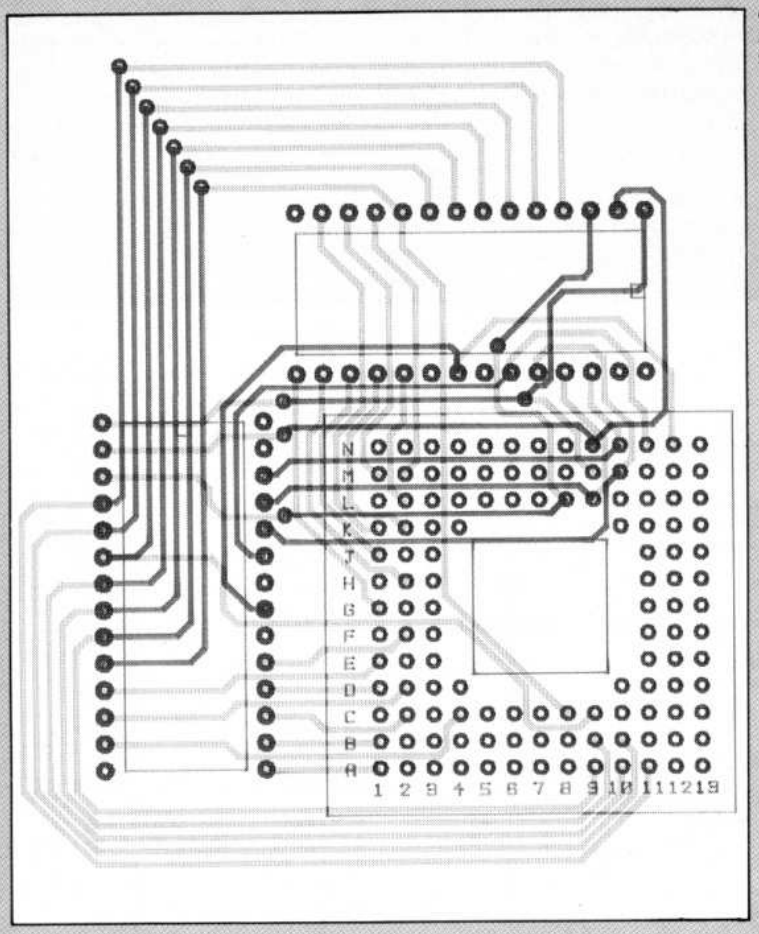
The features of Arc-PCB are listed in Fig. 1, where it is compared with Pineapple and Lintrack. For Arc-PCB, the maximum board size is 32 x 32 inches, which is larger than in Pineapple or Lintrack, and hence larger than either the double-height Eurocard needed for the largest Arc podules, or even the Arc motherboard. Equally importantly, the data interval is only 0.001 in (one thou or mil), which means that the accuracy of the output depends mainly on the printer or plotter. Furthermore, the grid interval can be varied freely from 0.001 to 1.0 in, which allows greater freedom of placement than with Pineapple or Lintrack, and hence higher component densities. This combination of board size and data interval can be handled by Arc-PCB while achieving high speed, thanks to the 32-bit processor of the Arc.

Arc-PCB supports up to eight logical layers – 0 to 7. This is sufficient for up to four layers of conductors or tracks, together with one or two "silk-screen" layers, carrying component outlines and text. Two or more layers of conductors give far greater freedom when routing interconnections. Also, when using surface-mounted devices, components may be mounted on both sides of the board. All eight layers are displayed by default, but they may all be cleared with the "." key, and then selected with the number keys. Alternatively, they may be removed individually with Alt+number keys. Pads are always drawn on layer 0, and when the program starts, the current layer for drawing lines and text is 1 by default, and may be changed with the number keys. The layers are colour-coded, with 0 in white, 1 in red, 2 in blue, 3 in green etc. Arc-PCB can handle up to 10,000 objects when running on a 305, 54,000 objects on a 310, and 300,000 on a 440. (These numbers are for Mode 12, and would be some 7000 fewer in Mode 20). Thus it automatically takes advantage of any extra memory, whereas Lintrack does not. With the above features, Arc-PCB is capable of full-blown professional work. Indeed, it is even possible to contemplate its use for designing something like an Arc motherboard – especially since it offers auto-routing (see below).

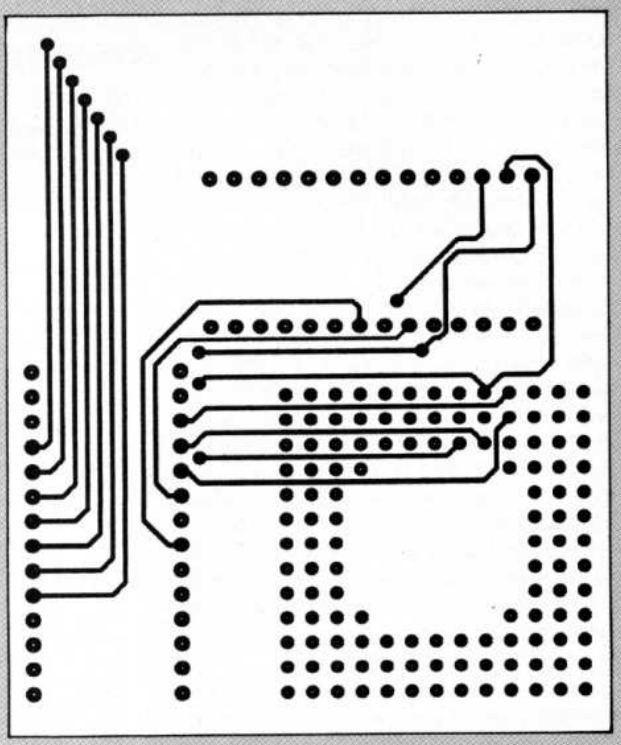
Layout

Arc-PCB (like the other two) is controlled largely by menus, along with single-key and command-line commands. The menu map is shown in Fig. 2. There are only two levels, with the main menu being shown on the right of the screen. Several of the options lead to sub-menus, for which the principal options (available via the mouse or keyboard keys) are shown at the bottom of the screen. On-line help may be accessed at any time, either general (with ":H"), or specific to a given menu option, by entering ":H <option name>". If you have already selected an option, eg DELETE, then entering "H" will bring up context-sensitive help on that item.

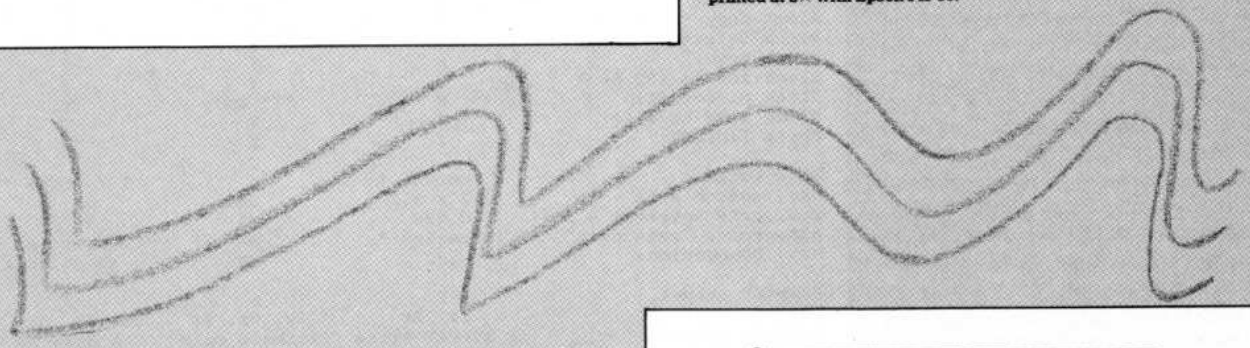
The cursor is controlled by the Arc mouse, and takes the form of full cross-hairs – which makes it easy to align objects or components vertically and horizontally. It is used both for drawing (positioning) and for making selections from the menus. Arc-PCB also allows the setting of a temporary origin, which is useful for measuring, and for "relative" positioning. To show the position of the cursor on the drawing area, the X and Y co-ordinates are displayed on-screen. They are updated continuously, but reflect that fact that the cursor moves in steps dictated by the current grid interval. This may be set with ":G n", where n is in 0.001 in, from 1 to 1000, rather than to only one or two fixed values. The default value is 25 (which is also the minimum value for auto-routing). The status line at the bottom of the screen also shows the current grid size, the current scale, the layers displayed, the current drawing layer, and the number of objects. With such large capacities for objects, it hardly matters that the free memory remaining is not shown. When you select Pad, LINE,



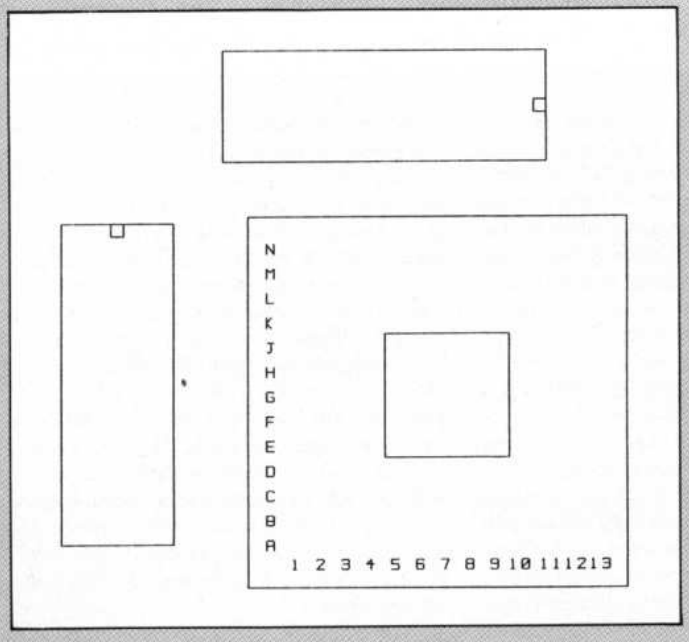
Combined artwork, plotted at 2× with Plotmate A4SM, fitted with HPGL ROM.

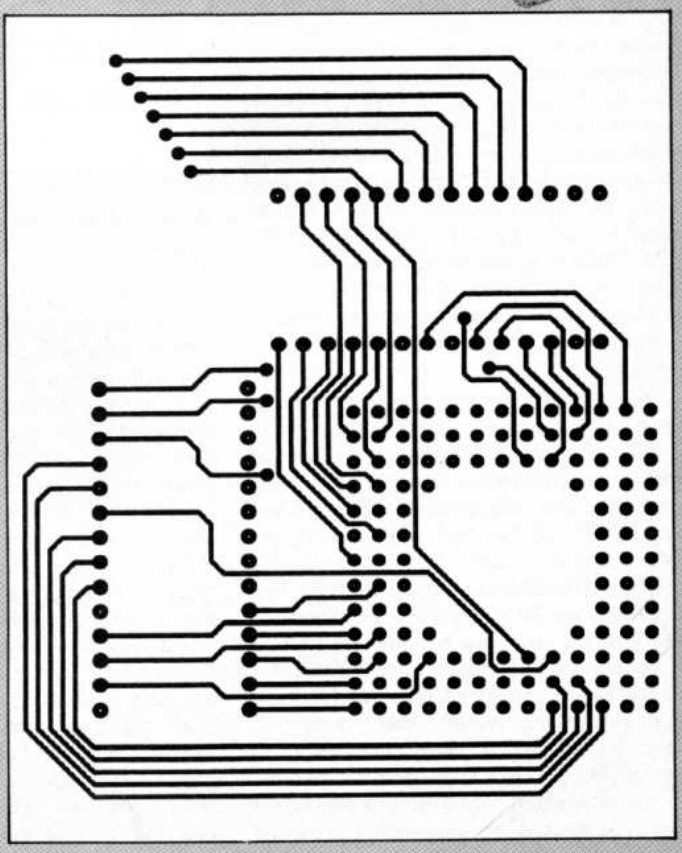


Top track artwork, printed at 2× with Epson FX-80.



Bottom track artwork, printed at 2× with Epson FX-80.





"Silk-screen" artwork, printed at 2× with Epson FX-80.

ROUTE, TEXT, or RAT, the current size is shown on screen in place of the number of objects.

Of the maximum board area of 32 x 32 inches, 32 x 30½ may be shown on the screen at once. To see the rest, and to see any part in close-up, it is necessary to be able to "pan" or scroll in any direction, and to "zoom". In Arc-PCB, "panning" may be effected by positioning the cursor on the centre of interest, and pressing the Space Bar, or with the cursor/direction keys. The "Zoom" level is set via a command ":S n", where n can be from 1 to 144. Alternatively, it may be increased by pressing "+" or decreased with "-". When the scale is less than 36, pads and lines or tracks are normally shown by outlines and single lines, but they may also be shown with filled lines by pressing "r". Above this they are usually shown to scale, although line segments are still displayed with square-cut ends (for speed), whereas they are printed or plotted with rounded ends. Since most PCBs are rectangular, layouts may be drawn with the bottom-left corner at or near 0,0. This point may be positioned at the bottom-left of the screen drawing area by pressing the "Home" key.

With any CAD package, moving and deleting objects can result in the screen display becoming untidy. In Arc-PCB, this may be corrected by forcing a Redraw by pressing "R", which updates the screen from the drawing data, without panning or zooming. Mode 20 displays the same amount of the design at once, but at double the vertical resolution, and takes somewhat longer to redraw. For much of the time drawing and editing will be at a relatively high zoom level, showing only a small part of the PCB layout, so redrawing will be quicker. However, in the limit, the redraw time (rather than the capacity for objects) may determine how large and complex a design the package can handle. Hence speeding redrawing can improve the handling, and increase the effective capacity. Firstly, the zoom, pan and redraw routines are written in ARM assembler. Another measure is to display tracks as single (pixel-width) lines, rather than to scale, even when the scale is 36 or more. This "Quick" mode may be toggled on and off by pressing "Z". Because of the detail it contains, text takes particularly long to draw. However, it is usual to put text on separate layer(s), which may be "turned off" for much of the time.

In Arc-PCB, the sizes of pads, tracks, and text may be varied in steps of 0.001 in, (1 thou or mil), rather than being of only certain fixed values. However, they each start with defaults – with pads of 60, tracks of 15, and text of 80 mil. The pad, line or track, and text sizes are set with ":A n", where n may be from 10 to 255 for pads, 0 to 255 for lines or tracks, and 20 to 255 for text. Moreover, the function keys may be defined to set eg sizes to particular values, using *KEYn: A n M, and used by pressing Ctrl+Shift+function key. (Operating system "star" commands may be issued at any time). The current pad size applies not only to single pads, but also to the arrays that have been pre-defined for Dual-In-Line (DIL) sockets, with 8 to 64 pins, and are shown in the main menu. The line size of "0" is used to specify the minimum line thickness – that of the plotter pen or printer pin – for drawing component outlines.

Drawing

The usual sequence for drawing a PCB layout is conventional pads and arrays on layer 0, surface mount pads and arrays on layers 1 and 2, component outlines on layer 3, and perhaps text on layer 4, and then tracks on layers 1 and 2. After selecting "1" for "pad", and positioning the cursor with the mouse, the left button is used to place conventional circular pads, with plated-through holes, and the right button for square, surface mount pads. In the case of the DIL arrays, pressing the left or right button defaults to drawing them aligned vertically, while pressing the middle button toggles between vertical and horizontal alignment. In Arc-PCB, rather than the exact track routes, lines may be drawn to indicate the logical connections – since the routing may be done automatically (see below). Lines and tracks are drawn with "rubber-banding", but the segments can only be horizontal, vertical or at 45 degrees. Lines may also be used to draw component outlines, and even a schematic of the circuit diagram. After selecting and entering text, pressing the middle button will place it forwards, and the right button will place it reversed (eg for printing on the underside of a PCB). Text may be up to eight upper-case characters, and is drawn by Arc-PCB, rather than using the character set of the printer or plotter. The last pad, array of pads, series of connected line segments, or text string may be "undone" immediately after entry, and the pads, line segments, or text strings may also be undone singly, in reverse order. In addition, any pad, line, or text entry may be deleted.

Fig. 1 PCB CAD PACKAGE COMPARISON

Publisher	Pineapple	Linear Graphics	Silicon Vision
Package	PCB/Autorouter	Lintrack	ARC-PCB
Computer	Model B/Master	Archimedes	Archimedes
Price(s) ex VAT	£ 85/£ 185	£ 160	£ 86.91/£ 169.57
Display resolution	320 x 256	640 x 256/512	640 x 256/512
Display colours	4	16	16
Max. board size - in	8 x 5.6	20 x 18	32 x 32
Data interval - in	0.025	0.01	0.001
Grid interval - in	0.025 & 0.1	0.01 & 0.05	0.001 to 1.0
Max. layers	3	4 (+2)	8
Max. objects	500	5000	10000 to 300000
On-line help	n	n	Y
Mouse/trackerball control	Optional	Standard	Standard
No. objects shown cont.	Y	Y	Y
Co-ords. shown cont.	Y	Y	Y
Set temporary origin	n	Y	Y
Pan	n	Y	Y
Zoom range	n	1x to 16x	1x to 144x
Redraw	Y	Y	Y
Quick display mode	n	Y	Y
Pad sizes	3 fixed	8 fixed	0.01 to 0.255 in
Surface mount pads	n	n	Y
Track/trace widths	3 fixed	8 fixed	"0" to 0.255 in
Text sizes	2 fixed	10 fixed	0.02 to 0.255 in
Undo last	n	Y	Y
Undo series	n	n	Y
Block copy	Y	Y	Y
Block delete	Y	Y	Y
Block move	n	Y	Y
Block rotate (90 deg)	Y	Y	Y
Block mirror/flip	n	"Y" only	Y
Block save to file	Y	Y	Y
Parts library	Y	Y	Y
Auto-route	1 routine *	n	1 routine *
Max. search area - in	3.7 x 3.7	NA	5 x 5
Min. grid interval - in	0.025	NA	0.025
Auto-route "rats nest"	1 routine *	NA	2 routines *
Max. connections	190	NA	as objects
Printer output	Y	n	Y
Scales	1x, 2x	1x, 2x, 4x	1x, 2x, 4x, 8x
Plotter output	£ 35+VAT extra	Plotmate only	3 drivers
HPGL plotter output	"	n	Y
Scales	1x, 2x	1x, 2x, 4x	1x, 2x, 4x, 8x
Drilling data	Print/plot only	Plot only	Plot & co-ords.

* higher price

* higher price

As well as normal loading and saving of the whole design layout, Arc-PCB also supports a full set of block operations. These start with the marking of a rectangular block or "region", which may then be moved, copied, deleted, mirrored, rotated, or written to disc. The layer and sizes of objects (pads, lines, and text) within a "region" may also be changed. These are more comprehensive than Pineapple, or even Lintrack (which can only mirror or flip about the "Y" axis). In Arc-PCB, the "region" always includes lines with even one end inside, and you cannot retain any connections while moving it, as with Lintrack. However, Silicon Vision believe that in such cases, better results would be obtained with their planned "upstream" module, using automatic placement and routing (see below).

The facility to write blocks or "regions" to disc is matched by the ability to read files from disc. Whereas "LOAD" loads the selected file at the origin, "USE" allows you to place it anywhere within an existing layout.

Arc-PCB allows reading from both the USER (or working) directory, and a LIBrary (or read-only) directory. In each case, the first eight characters (of the ten allowed by ADFS) of up to 25 names are displayed (in place of the main menu) on the right of the screen. Below this, and in yellow, appears "MORE", for use if there are more names than will fit at once, and "RETURN", for returning to the main menu. Any names appearing in red are sub-directories, which may be entered by clicking on them. In this case too, clicking on "RETURN" returns you to the main menu. As supplied, the USER directory contains a number of demo drawings, and the LIB directory contains files for a number of Pin Grid Arrays, such as are used for Central Processor Units and similar complex chips, and a 16-pin Dynamic RAM (DRAM), complete with the standard connections required when they are set in arrays. Anything not provided (including special text strings) can be drawn by the user, and saved to the USER directory. By entering a "star" command, files may be copied or renamed from the USER to the LIB directory. It is possible to have several LIB directories on different discs.

Auto-routing

A notable feature of Arc-PCB is auto-routing, as also offered by Pineapple, but not by Lintrack. The grid size must be set to a multiple of 25 mil, and all Integrated Circuit pads should be on a 100 mil grid. The two end points must be within a certain "search" area, although longer interconnections may be handled by the user defining intermediate points. However, Arc-PCB offers a search area which – at 5 x 5 in – is larger than that in Pineapple, and enough for many projects. Although this implies that the RAM space and time required for auto-routing is greater, the router routines are written in ARM assembler, and the Arc is much faster than the Model B/Master. (The router routines do not apply "design rules" on clearances between pads and tracks etc, but this is unlikely to be a problem in practice – such as with the standard pin spacing of 100, and the default pad size of 60, and track size of 15).

Performance

Since the Arc is a 32-bit computer, the above constraints are likely to be equal to or better than those of any package designed to run on a 16-bit machine, such as an IBM-PC or AT, a Mac I, an Amiga or an Atari ST. In general 2-D CAD packages, a market leader (AutoCAD) and an associated file format (DXF) has emerged, together with well-known drawings, such as the Space Shuttle "Columbia", which makes benchmarking easy. However, this is not true for PCB CAD. Hence I have used a layout drawing with 4000 items, as when testing Lintrack (see A&B Computing, 88/8, p 36). In Arc-PCB, the redraw times varied from 4 s at 1x, to 2.5 s at 16x (and 2.3 s at 144x), which is slightly quicker than for Lintrack Arc. Moreover, both the screen redrawing and the auto-routing are subjectively rapid.

Output

In Arc-PCB, the design layout must be saved or discarded before you enter the print or plot module. These are very similar. In each case, you select the design file from the display of the USER directory, followed by the layers to be output. Layer 0 contains just the conventional pads (and "vias"), as required for the "Drill" drawing. The same layer may also be output to make a "solder mask", which is a coating to limit solder access only to pads (and "vias") during flow-soldering. Layer 0, together with Layers 1 or 2 (which are usually the top and bottom tracks), make up the "artworks" required to control the etching of the copper layers of the board. Layers 3 and 4 may contain component outlines and text, for printing on the PCB as "silk-screens". If a layer is required to be output flipped or reversed, this may be done within the Arc-PCB design program, and saved as a separate file. The outputs may also be scaled down, inverted, and reversed by photographic means, usually by the PCB manufacturer. In Arc-PCB, the data is taken from the design database, with its resolution of 0.001. Using the Hewlett-Packard Graphics Language (HPGL), with its nearly identical resolution, Arc-PCB can be much more accurate than with the Acorn VDU language, with only about 0.02 inch, as used by Lintrack. Accuracy can be further increased by outputting at larger scale, eg 2x, and photo-reducing.

Fig. 2 ARC-PCB MENU MAP

(Pad) (DILs) 8 to 64	Place conv., Vert/Horiz, Place surface, Undo last, Undo series. "
LINE	Mark start/end, Mark mid-point, Abort, Undo last, Undo series.
REGION	Mark region, Abort, Move, Copy, Delete, Mirror, Rotate, Write.
DELETE	Select item.
ROUTE	Mark start/end, Abort, Undo.
TEXT	Enter, Place (forward), Place Reverse, Undo.
RAT	Mark start/end, Mark mid-point, Abort, Undo last, Undo series.
PATTERN	Start auto-routing.
LEE	"
LOAD	Select from User directory.
USE	Select/place from User directory, Undo.
LIB	Select/place from Lib directory, Undo.
SAVE	Enter filename.
PLOT	Plotmate/HPGL/Graphtec, Normal, Draft, Arc-PCB, Quit.
PRINT	Epson compatible, Normal, Draft, Arc-PCB, Quit.
QUIT	

Printers

Since plotters are relatively expensive, and not everyone has one, it is very useful to be able to output layouts to a printer – both for checking purposes and even for final artwork. This is possible with Pineapple and Arc-PCB, but not with the Arc version of Lintrack. The printer may be any Epson-compatible 9-pin machine that supports quad-density graphics, which gives a resolution of 240 x 72 dots per inch. PCBs up to 8 inches by say 10 inches can be printed with an 80-column printer, at 1x scale. By saving the layout in sections as separate files, larger layouts, and/or larger scales may be output on several pages. With a printer, more than one layer may be selected at once for output. After selecting the design layout by name, the layer(s), the scale, and Draft or Normal quality, printing is started by pressing the right button. Arc-PCB first writes to a temporary file, to convert the object-based, vector data to the raster format suitable for printing. Normal quality is required for artwork, but takes over three times as long as Draft.

Plotters

Arc-PCB supports the Plotmate plotters using the Acorn VDU language, although they are available only in A4 (8.27 x 11.69 in) and A3 (11.69 x 16.54 in) nominal sizes. Moreover, as noted above, the Acorn VDU language gives a relatively low resolution, and better results may be obtained by fitting the Plotmate plotters with the HPGL ROM, which is priced at £40 plus VAT. HPGL is also supported by many other plotters – including the Hitachi 672 and 673, and Roland plotters. In addition, Arc PCB supports the Graphtec plotters. Both HPGL and Graphtec plotters are available in nominal sizes from A4 (8.27 x 11.69 in) up to A0 (32.11 x 46.81 in). (The user is expected to match the plotter and paper to the size and scale of the design). With a plotter, only one layer may be selected at once, but if necessary, further layers may be selected and plotted on top of the first – probably in different colours. The Arc-PCB plotter program shows the numbers of the pens supported – ie including Pen 0 for Plotmate, and excluding Pen 0 for HPGL and Graphtec. After selecting the plotter, the numbers of the pen, the scale (1x, 2x, 4x, 8x), and Draft or Normal, pressing the right button starts the output. If you press the "P" key instead, the plotfile will be written to disc, with a filename indicating HPGL or Graphtec, the layer number, and the design layout name. Arc-PCB can also output the drilling data as a text file of X, Y co-ordinates, measured in 0.001 in (thous or mils).

Documentation

The manual is well laid out, with a clear, typeset appearance. The Introduction covers

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installation and start-up, and the main body is a Tutorial and Reference combined. This is followed by summary lists of the Single Key and Command-Line Commands. These are also available in the on-line help, which has context-sensitive screens for each menu option.

Availability

The Arc-PCB software is available in two versions. The Entry Level includes all the features *except* the auto-routing, and is priced at £99.95, whereas the full version is priced at £195 – both including VAT. In addition, Silicon Vision are offering turnkey systems. For those users who already have a plotter, or intend to use a printer, systems with an Arc 305, 310, 310M, or 440, and a colour monitor, are priced at £1220, £1350, £1449, and £3310 respectively – all including VAT and carriage. Adding a Plotmate A3M single-pen plotter would increase these by £599. Variations on these, with eg a multi-frequency monitor (to allow the use of Mode 20), or another plotter, are also possible. These prices represent significant savings on the same items bought separately, and are all subject to educational discounts.

Discussion

Pineapple PCB is a worthy application for the Model B/Master, priced at £85 plus VAT. However, the capacity of only 500 objects limits it to small projects. It is remarkable for offering an auto-route capability – though this is somewhat expensive at a further £100 plus VAT.

Lintrack also originated on the Model B/Master, and migrated – via the IBM-PC/RM Nimbus – to the Archimedes. This accounts for the limited capacity of 5000 objects (less than half that of Arc-PCB in a 305), and the somewhat untidy menu structure. The Arc version offers rapid redrawing, and some advantages in editing, such as the ability to "pull" components around the layout, while retaining the connections. However, it lacks any auto-routing, and is thus comparatively expensive at £160 plus VAT – though this is subject to an educational discount.

Arc-PCB offers much higher capacities for objects, which increase with the memory available. The maximum board size, data interval, and other constraints are entirely adequate for substantial professional projects, while screen redrawing is slightly faster than in Lintrack Arc, and significantly faster than with CAD packages running on 16-bit machines. The menu structure and commands are simple to learn and use, and the editing facilities are comprehensive. Output can be to a graphics printer or a choice of widely-available plotters. All this is available in the Entry-Level version for only £86.91 plus VAT. The full version of Arc-PCB includes auto-routing (with two routines), and is priced at £169.57 plus VAT, which is far less than comparable packages for the IBM-PC. Moreover, the package originates in the UK, which makes it easy to obtain support, and to suggest improvements.

Future Developments

Silicon Vision plan to offer a separate package, for use "upstream" of the Arc-PCB layout package. This will be capable of "schematic capture", logic simulation, and automatic placement of components, followed by auto-routing. It will be designed to work in conjunction with Arc-PCB – eg for manual editing of the layout, and for output.

Conclusions

As the first PCB layout package written originally for the Archimedes, Arc-PCB has a better specification and higher performance than either Pineapple PCB (which runs on the Model B/Master), or Lintrack – even in the Arc version. Indeed, Arc-PCB provides much of the functionality of the "heavy-weight" PCB layout packages which run on the IBM-PC and compatibles (and are much more expensive). However, the capacity of Arc-PCB is much greater and the speed generally much higher – thanks to the 32-bit processor of the Archimedes. It therefore approaches the capabilities of packages running on other 32-bit workstations (and costing even more). Although hard to assess in a review such as this, it is probably capable of handling the layout of PCBs as large and complex as the motherboard of the Arc itself. Silicon Vision are at : Signal House, Lyon Road, Harrow, Middlesex, HA12 AG. Tel: (01)422 2274 and (01)861 2173.

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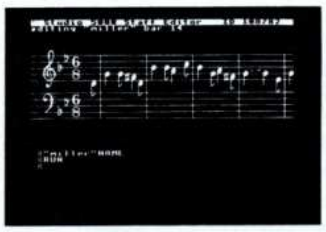
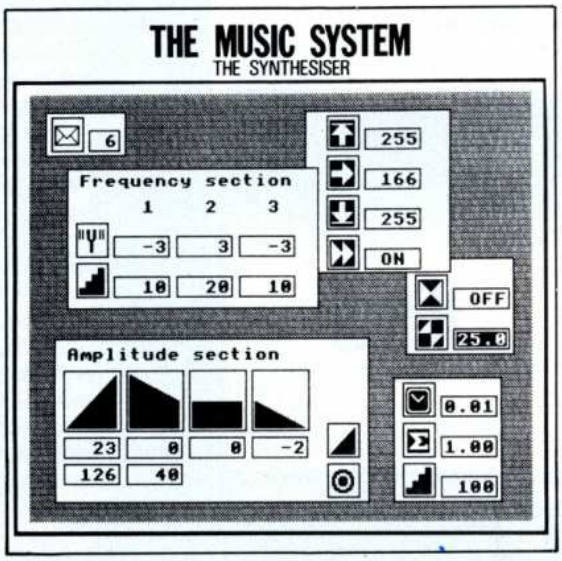

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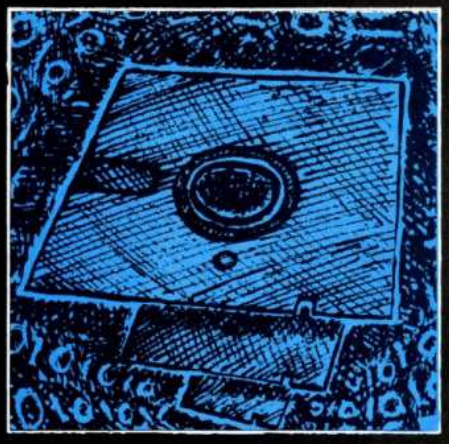
Clive Grace

BACK TO BASICS

Just when you thought BASIC V was fast enough, DABs come along and make it faster!



Acorn's BBC BASIC programming language was always reasonably fast as far as an interpreted language is concerned. BBC BASIC running on the Model B and Master is still faster than Amiga BASIC – the Microsoft language bundled with the A500. BASIC 5, the Archimedes' mother tongue is, to all intents and purposes, the fastest BASIC ever run on a single user system anywhere in the world (Acorn's claim to be the fastest micro in the world is, by the way, based on Machine code benchmarks).

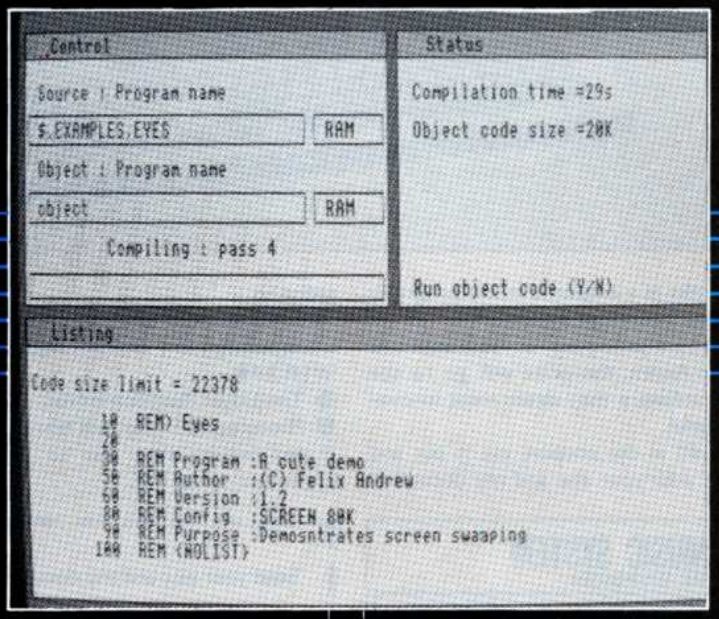
BASIC V suffers from all the usual problems of speed when using large programs however, this is due to a number of inherent problems associated with the way BASIC is stored in memory, variables are stored in long lists of tables, as are arrays and "loop counters", and these all need to be looked after by the programming language or environment, this means that the computer is always sorting out pointers, making sure stacks of numbers are properly ordered, and that loops and memory locations are sufficiently cleared or updated when they are finished with.

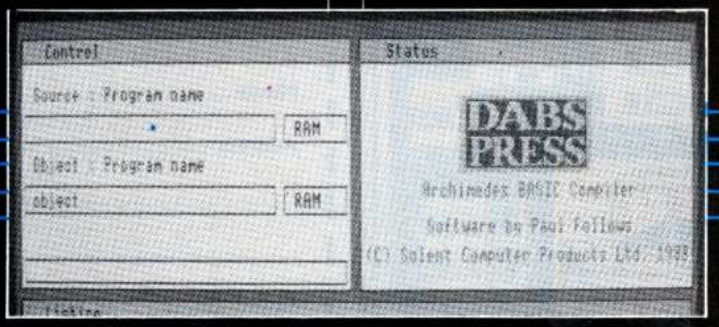
The opposite can also be a problem though: Machine code can be fraught with proramming potholes that can literally bewilder the programmer, with Machine code (or assembly language) programming, you are quite literally in control of *every function of the processor* down to the last tiny of detail. You have to ensure all the registers and stacks are properly looked after, and there is also the problem of programming a new processor architecture – RISC technology is not new, but it is quite a bit more recent than CISC processor architectures such as 6502 and 68000 – no matter how good a programmer you are, you will still need to get to grips with totally new programming concepts such as *pipelining* and, *round robin time slicing* (yes – there is a 6502 equivalent, but the similarity ends there).

Compiler Companion

The obvious answer to the problem of writing faster programs is to *Compile* them. This is a process by which program statements are converted into machine level instructions and then run (often at faster speeds – as you may expect).

DABS press have just released a compiler for BBC BASIC 5 on the Archimedes. Called ABC it boasts the ability to convert 99% of the BASIC keywords into ARM machine code instructions, no run time systems to load, no licensing agreements to legally restrict the number of packages distributable under the compiler (as opposed to the wanton greed of the Acorn/Richard's Computer Product's BCPL compiler licence for the Beeb).





All you do is key in your program, tweak it a bit for the sake of good syntax and load it into your complier – It is possible to take BBC BASIC programs written for the BBC Micro and spool them into the Archie, they can then be compiled to run a machine code on any Archimedes!

The Package

ABC was written by A&B Columnist Paul Fellows – Up until last year, he was head of the team that wrote the Archimedes Operating System, prior to that he was head of the languages team, and he was responsible for the Master Compact's windowing system. He has written a small Pascal compiler, and like ABC, he wrote it in BBC BASIC!

Yes folks, ABC was originally written in BASIC and he used the program to compile itself! This is quite a normal procedure actually as I used to write compilers for a small company (before I joined A&B) and we were doing this all the time, not only is it a good way to ensure that the Compiler actually works, but it is also a very efficient way of programming low level languages (as compilers are). I hope this also bury's the idiotic belief that BASIC is not a powerful language, and that it is incapable of generating efficient code!

Did I say that ABC was compatible with 99% of the BASIC keywords?

In fact, ABC is capable of compiling every command *other than* **EVAL** – the Evaluate a function/string operation, the other commands that are not compiled are interpretative commands such as LOAD, SAVE and so on. These commands are listed in **Table 1**.

The keywords that *are* supported are listed in table 2.

Structuring programs may be a little different though, you are not allowed to have multiple exits such as:

```
10 DEF PROCab
20 IF A=1 THEN ENDPROC
30 ...
40 ENDPROC
```

or

```
10 REPEAT
20 .....
30 IF A=1 THEN UNTIL TRUE
40 ...
50 UNTIL TRUE
```

Instead you are advised to use the cumbersome GOTO command to go to the end of a PROCedure or loop, these are the sorts of things you will probably have to do when compiling your program for the first time, but it is not advisable to write using GOTOs in the source code though, as it is a better structure to use multiple ENDPROCs than GOTOs

The floating point processor version of the ARM will be supported by the compiler, and for the time being, the ABC compiler will quite happily rung programs using the FPE (floating pointer emulator). This will therefore produce more accurate eight byte arithmetic results as opposed to the five byte arithmetic ones produced by the interpreter. Programs that utilize the FPE will not show any significant increase in speed (as they are limited by the efficiency of the emulator), but when the ARMs maths co-processor, or the rumoured ARM-II chip is released (having the math functions on the chip), then the compiler will make full use of the additional facilities.

In-Depth

ABC isn't just capable of converting BASIC into machine code; The Archimedes' architecture supports various file "header" types that state whereabouts in memory reside – for example on the BBC Model B there is the ROM header information that gives the operating system the necessary information regarding service or language entry points. On the Archimedes there are a great deal more! For example, relocatable modules need no longer be written in ARM assembler or, dare I say it, in BBC BASIC (do you realise how slow that action makes the average Archie?). With ABC there are a number of compiler functions that can be used to create special header info this will, in turn, tell the OS whereabouts in memory the software is to reside.

As many of you will still have the old Arthur OS and not RISCOS, you will need to hand set the system configuration in order to run ABC, you will need to have your SPRITE-SIZE down to 10, and SCREENSIZE at around 20, but ABC will work under a number of different configurations.

You can have ABC running as either a module or as a RAM based program. If you have a lot of compiling to do, and you want to flit in and out of the ABC environment, then I suggest that you load the 80K or so of the ABC-module version. Any programs you load in after ABC-Module will happily co-exist in the same machine providing you have the memory – 1 megabyte is not necessary, but, as in all cases it is advisable.

After backing up your compiler (either to floppy disc or hard disc), you are ready to use ABC, I really recommend using the 800K file format, as the compiler disc has quite a lot of space eaten up by the various programs.

Easy as 123

The compiler is very easy to use, thanks to the Archimedes' windowing environment being utilized to the full. The software is built up of three windows; The Status window, the listing window, and the Control Window.

Status contains the DABs press logo and any ABC status messages, such as error messages. This window is used to display the size of the object code and the compile time taken.

Listing is the large window at the bottom half of the screen. This window lists the program as it is compiled and, if an error is encountered, then the offending line is displayed – with the problem highlighted, if possible.

You can also enter the BASIC editor from this window (and flit back to the ABC panel with ease) but the most useful function of the window is to allow OS commands to be issued and display any output.

The most important window is the Control window. Situated at the top left hand side of the screen, this window displays the source and object filenames, where they are to be buffered (as either RAM or DISC files) and also a neat little bar line showing the compiler's progress. The compiler needs to take a maximum of four passes in order to convert the BASIC lines into machine code.

ABS, ACS, ADVAL, AND, ASC, ASN, ATN, BEAT, BEATS, BGET, BPUT, BY, CALL, CASE CHR$, CIRCLE, CLOSE, CLG, CLS, COLOUR, COS, DATA, DEF, DEG, DIM, DIV, DRAW, ELLIPSE, ELSE, END, ENDCASE, ENDIF, ENDPROC, ENDWHILE, ENVELOPE, EOF, EOR ERL, ERR, , ERROR, EXP, EXT, FALSE, FILL, FN, FOR, GCOL, GET, GOSUB, GOTO HIMEM, IF, INKEY, INPUT, INSTR, INT, LEFT$, LEN, LET, LINE, LN, LOCAL, LOG LOMEM, MID$, MOD, MODE, MOUSE, MOVE, NEXT, NOT, OF, OFF, ON, OPENIN OPENOUT, OPENUP, OPT, OR, ORIGIN, OSCLI, OTHERWISE, PAGE, PI, PLOT, POINT POS, PRINT, PROC, PTR, QUIT, RAD, READ, RECTANGLE, REM, REPEAT, REPORT RESTORE, RETURN, RIGHT$, RND, SGN, SIN, SOUND, SPC, SQR, STEP, STEREO, STOP, STR$, STRING$, SWAP, SYS, TAB, TAN, TEMPO, THEN, TIME, TINT, TO, TOP, TRUE UNTIL, USR, VAL, VDU, VOICE, VOICES, VPOS, WAIT, WHILE, WHEN,

Commands supported by the Compiler.

APPEND, AUTO, CHAIN, COUNT, CLEAR, DELETE, EDIT, EVAL, HELP, LIST, LVAR, LOAD, NEW, OLD, RENUMBER, RUN, SAVE, SUM, TRACE, WIDTH

Commands not supported by the Compiler.

Compiler Directives

A Compiler directive is essentially a system call to the compiler to perform certain functions, such as turn of keyboard scanning, and ignore compilation, these commands are put in curley brackets after a REM statement.

You do not need to have the source code listed when compilation is underway, and with the {NOLIST} directive, you can halt it at any time.

{LIST} will start it up again.

You can have whole sections to be left uncompiled by using the {NOCOMPILE} directive. You cannot, of course, have conditional compilation.

Directives are also used for turning BASIC programs into modules, DABs supply the compiler with an example using a silly tune as a module, but you could, if you really wanted to, use any BASIC program as an RM.

If you find that you will require more heap space or more stack size, then you can specify this in bytes by using the {STACK} and {HEAP} directives, likewise, there is adequate stack limit checking, so if the stack collides with the heap, then an error message will warn the user.

All of these are quite advanced features of the compiler, one particularly useful directive is {NOESCAPE}, a directive used to ignore the keyboard's scanning routine. This has the advantage of dramatically speeding up the program running, so if you need some extra speed, but do not need to check for the <Escape> key, then I would recommend using this directive – it also makes your programs more secure.

Differing Structures

Due to the very nature of interpreted languages it is impossible to expect a compiler to be one hundered percent compatible and so. there are a number of subtle differences, many to BASIC's advantage!

All of the usual nesting of structures are supported using IF, THEN ELSE and ENDIF, it is now possible to have one of BASIC 5's "features" corrected by allowing what DABs call *The Dangling Else*. For example, the following line:

```
IF A%>B% THEN IF A%>C% THEN PRINT "A"
ELSE PRINT "C" ELSE PRINT "B or C"
```

Under the interpreter, the first ELSE statement applies when either the earlier IF statements are FALSE, thus only A or C is possible, is expressed in a logic diagram (such as those used in "exception languages" like Filetab-D running under Unix, you will find the listing as follows:

A	B	C	Output
1	2	3	C
1	3	2	C
2	1	3	C
2	3	1	C
3	1	2	A
3	2	1	A

A	B	C	Output
1	2	3	B or C
1	3	2	B or C
2	1	3	C
2	3	1	B or C
3	1	2	A
3	2	1	A

Under the compiler however, it considers the innermost IF and the innermost ELSE together (likewise, the outermost IF applies to the outermost ELSE).

This isn't by any means a limitation, and the chances of writing a line like this are not very likely (as most people like to split off their IFs and ELSEs, but this is a good example just how different compiled languages treat common programming structures.

Naturally a program contains a great many variables, and sometimes there are variables with the same name, for example, you may use what are called *Local* variables. withing procedures and functions that are merely versions of a global variable that is to be updated and or discarded upon leaving the procedure or function.

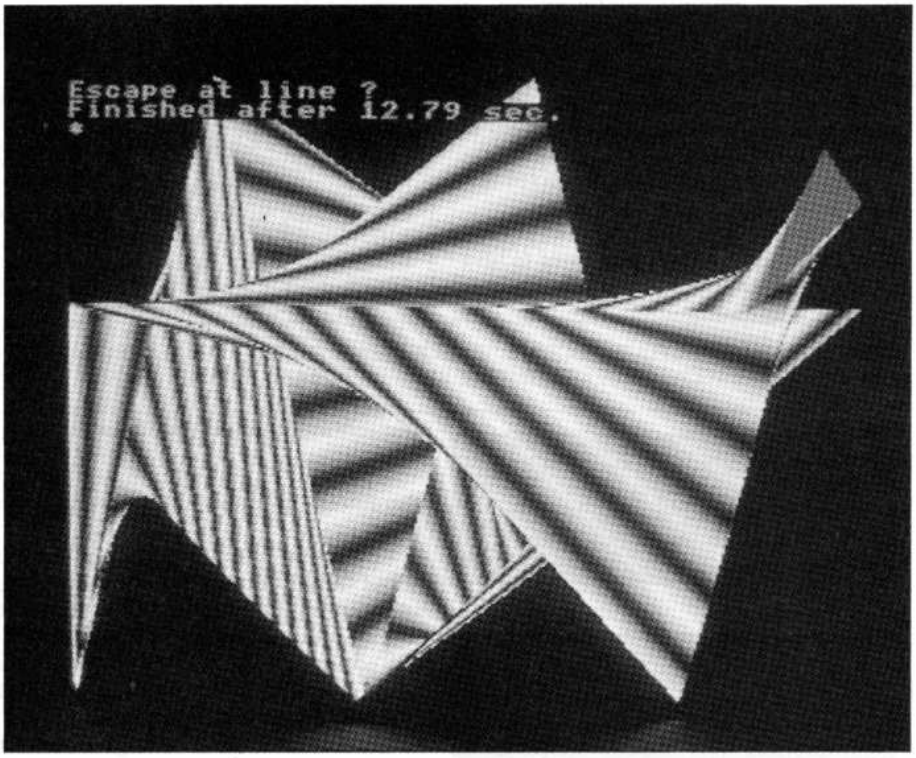
Machine code programs require variables like their basic counterparts, but these have to be achieved by setting aside data areas in memory and swapping around registers of data.

BASIC only allows access to LOCAL variables when inside their particular procedure or function, ABC's approach is to class all variables as global, unless they are declared explicitly to be local to the procedure or function in which they are used.

In short, be careful with your variables, if you are just starting off with the compiler, then it is better to have a different variable within a PROCedure and pass the value of the variable into the main program by:

LET oldvariable = newvariable

than it is to get muddled with the complexities of being "in scope", if you have been programming with BASIC 5 for a while, you will no doubt know where LOCAL variables should apply and you will thus be able to sit down and "tweak" your listing before putting it to the tender mercies of ABC.



Even though the ARM's math's co-processor isn't with us at the moment, the FPE is, and ABC's ability to support floating point numbers is, in my mind, a fairly major step.

The compiler stores numbers in the standard IEEE four byte, single prescision, format (as opposed to BASIC's weird and wonderful – albeit understandable – five byte method, this is a potential vipers nest when you are writing math-intesive routines and programs, as you may find that a number of rounding errors are being introduced.

DABS tell me that the compiler is sometimes more accurate then the interpreter and at other time vice versa. Likewise with FP indirection, BASIC will transfer five bytes of information whereas the compiler will only transfer four.

The Compiler has an additional EQUate function – EQUF (for use in the assembler) whereby you can store a floating point constant number like 3.14159 in four bytes of memory.

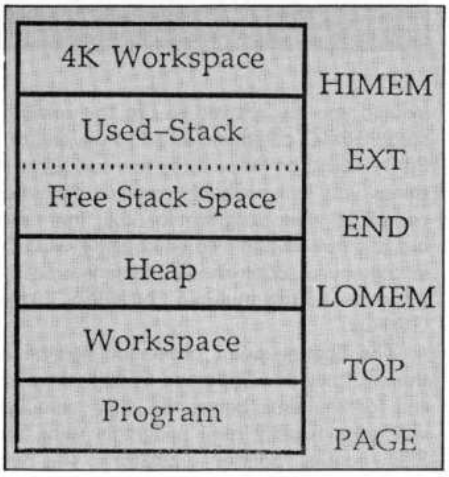
Pseudo variables such as HIMEM, PAGE and TOP will all successfully compile, but they will naturally return different numbers as a machine code file will often occupy a different memory location to a BASIC program, tests for PAGE (to ensure the program is sitting in a low, or high enough part of memory can still be made, but you should tread with caution with readings such as END and LOMEM as ABC uses the bottom of the stack and the top of heap in completely different ways.

Table 3 shows a very rough memoy layout of the way ABC treats workspace and heap space.

Machine Code

It is possible to include your own machine code programs in with your compiled code, but by far the best method is to write your own routines and assemble them to be called in from outside the main body of program.

The two commands, CALL and USR have been extended so that you can fill the eight registers (R0 to R7) with data unpon leaving the called routine.



Simplified memory map for the DABs compiler in the Archimedes.

USR has a similar facility whereby you can place any value (from a variable if you like) into the registers, you now no longer have to place A% to H%, you can even put numbers straight into the USR routine.

Arrays are supprted up to BASIC IV compatibility level. There is no attempts to make the LOCAL array handling facilities (as in BASIC V) nor as a control variable for FOR loops.

In use

The only decent compiler for the BBC Micro was Computer Concept's *Accelerator,* and I must admit there were quite a few similarities between ABC and the older compiler for the 8 bit system.

ABC does, however, have a number of distinct advantages over existing compilers such as C and FORTRAN or even ISO-PASCAL, and that is one of familiarity. Many people over the world have written applications using BBC BASIC, many of us can

programs the language on the BBC Micro well, and with the BASIC IV compatibility as well, ABC can be viewed as merely a tool by which you can get programs running faster and more efficiently in next to no time at all.

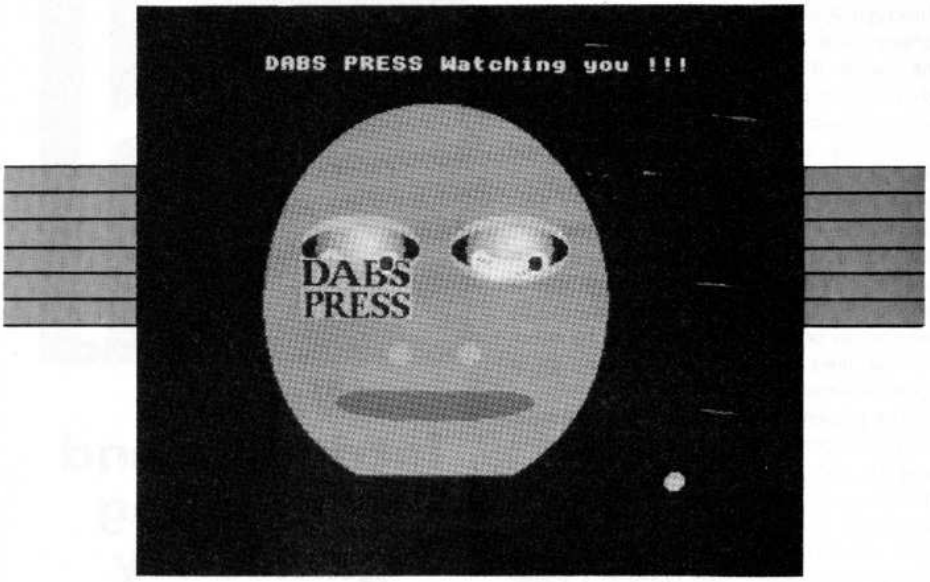
BBC BASIC is also a lot easier to program than, say, C as there are whole lot of routines to be learned, the programming environment isn't as friendly and, if you are new to "C", then you will have to go throght the whole process of learning "C" – a language that, I am afraid, does not lend itself to hacking and experementation.

A representative of DABS came up to the office to drop off the copy of the compiler and whilst he was there, he showed off a number of programs (also supplied on the Compiler utiltities disc). Just after a short while, we decided to compile a BASIC program featuring on our Red Keys disc – *Blast* a pretty speedy shoot 'em up, just for fun, we compiled the program, and, after just *five* minor corrections to the listing (changing... THEN ENDPROC to ...GOTO <endproc>), we had a very, very fast compiled version of the game.

This game was written without the compiler in mind, and I think this is a good example of the speed and flexibility of the compiler not to mentio th efficiency of the compiled code.

We have, therefore decided to include two versions of Blast on the disc, one is the original BASIC V listing and the other the compiled version – it will run on Archimedes 305 and 310's (and, we assume the 400 series as well), so you can see for yourself just where the advantages are.

ABC is a very good piece of software being sold at a sensible price. The £99 price tag is low enough to be affordable by many



home programmers, and is, incredibly cheap for software houses who are more used to £1500 – £1600 for similar software to run on VAX development systems. For general programming, the speed is comparable to running an Archimedes three to four times faster, although some routines can be many thousands of times faster still!

Over the past five years I have written a great many routines and packages for the Beeb (in BASIC). Needless to say I took the ABC home and ported them all across as soon as I could just to try out the efficacy of the system.

I was impressed.

The thing is that BASIC is not very well suited to the process of compiling, the ARM on the other hand, is ideally suited to running good compilers so, and Paul Fellows has written what is unquestionably one of the most impressive pieces of software I have yet seen running on the Archimedes.

The code is efficient, reasonably compact (thank God we're not running on 32K machines anymore!) and the speed is justifiably fast where it cunts.

It will not take any BASIC program and spit out ARM assembler for you, and there are, of course, the same old advantages to programming in ARM assembler (for which Paul is well into part four of his series for us), but I seriously wonder whethet I will bother writing in assembler other than to build up libraries of routines I have lost since going 32 bit.

It was a pleasant suprise to find that ABC was bug free as well! I hope both Paul and DABs will forgive my initial skepticism when I first saw the program as good compilers for other computer systems take at least a couple of years to come to light (hence this is why there are at present no good Amiga BASIC compilers!)

I now have no reservations in sayting that ABC is a vital part of any programmer's toolbox, it puts other compilers on other systems to shame, and I think both Paul Fellows and DABS press deserve all the success they can get with ABC.

It really is as easy as 123!

New PCW Benchmarks

Benchmark	BASIC V	ABC	Ratio	%Increase
GRAFSCRN	1.68	0.84	2:1	200
STORE	6.50	6.50	1:1	0
TEXTSCRN	2.46	2.23	1:1	0
INTMATH	0.19	0.92	9:1	900
REALMATH	0.26	0.30	1:1	0
TRIGLOG	1.20	3.38	1:3	-300
SIEVE (1651 primes)				
SIEVE	5.16	0.58	9:1	900
Recursive Finctions				
TAK(18,12,6)	27.53	0.78	25:1	2500
fibonacci	49.43	1.40	35:1	3500
Ackerman (3,4)	4.89	0.12	40:1	4000
Array Operations				
Int-Array	1.84	0.34	5:1	500
String-Array	2.40	1.60	1.5:1	150
Real-Array	2.04	1.34	1.5:1	150
Integer Loops				
WHILE	13:11	0.40	33:1	3300
REPEAT-UNTIL	12.75	0.37	34:1	3400
FOR-NEXT	2.15	0.29	7:1	700

Benchmarks and figures are taken from the DABS press manual.

FREE try out the ABC for yourself!

DABs have produced a special cut down version of the compiler for you to try out FREE of charge.

It has been limited so that it will only compile certain commands such as GOTO and PRINT, but, you will be able to try out the compiler for yourself just to see how good it is at making your own BASIC programs turn into super-fast ARM machine code.

It has been included free of charge on our Red Keys disc number eight, for you to try out, simply fill in the form in this issue of A&B and you can try it out for yourself.

Jonathan Evans

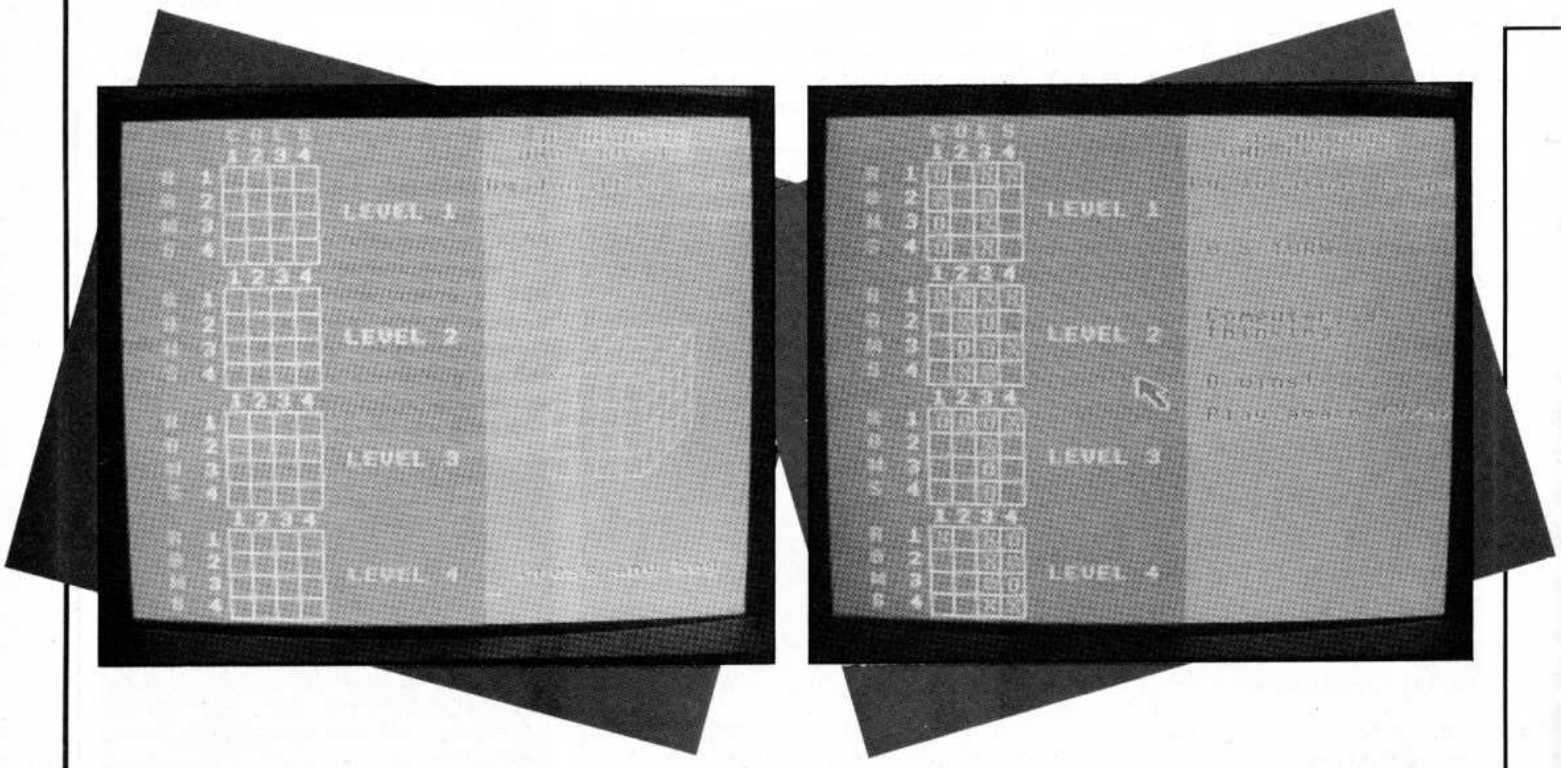
Want an intriguing and stimulating game? Try our 3D-OXO!

ARC OXO!

Although Archimedes BASIC has many extensions and improvements compared with the earlier 8 bit BBC versions, the major advantage to programmers is, of course, the huge increase in computing power provided – especially in terms of speed, power and graphical display. This means that certain types of program that were either very difficult or impossible to implement on the BBC and Master series are now quite feasible. A good example arises with strategy games where large amounts of computation may be required in order for the machine to check winning lines and/or play a decent game against a human opponent.

The present program actually arose from a long abandoned attempt at a 3 dimensional noughts and crosses game for the BBC Master machine. I originally wrote a game based on a 3 x 3 x 3 cube, but found that the game was too simple and trivial to be worth playing – as readers who typed in a similar program from one of our rival magazines a few months back will have discovered to their cost! However, I realised that a 4 x 4 x 4 cube would make a really interesting and challenging game. This program was, however, abandoned on discovering that the Master took far too long even to check the several hundred possible winning lines required to monitor a two player game. I never got as far as actually *implementing* a strategy for the machine to play its own game.

A few weeks after the arrival of my Arc, I remembered the program and decided to try it on the new machine. The transformation was staggering! With the Archimedes able to perform the necessary computations in a second or two. Thus encouraged, I enhanced the screen display, added mouse control and implemented a computer strategy to play against. The result is a demanding and complex – but not impossible – game, requiring a combination of visual imagination and strategic cunning for success.



Playing the game

For those interested only in playing the game, I will give some general description of its features first and defer my comments on the implementation for those interested in writing similar programs of their own. To use the main program 3DXO you must first RUN 3D-DATGEN which creates a data file on the disc needed by the main program. On loading you will be presented with a choice of three options: (1) a two player game in which the computer provides the display and checking to permit two people to play, (2) a game where you can play against the computer and (3) a demonstration mode in which the computer plays against itself.

In all cases players must place X's and O's alternately in empty squares until one succeeds in making a straight line of four symbols in any direction through the cube. The cube is represented on the screen as four levels or slices, each of which is a 4 x 4 square. Apart from the obvious winning lines which you can form by horizontal, vertical and diagonal lines within each of these levels you must also consider the lines which run between squares at different levels: from top to bottom, diagonally from the top edge one side to the bottom on the other, and finally the four lines which run diagonally between opposite corners of the cube – a total of 495 possible winning lines in all!

After choosing the game option and whether to play X or O (X always starts) you enter your own moves simply by moving the mouse pointer to the required square and pressing any button. The computer will refuse to accept illegal moves and will check for a winning line between each move. If you play against the computer you will find that it plays very quickly, within a couple of seconds of your own move. It plays a strong but not unbeatable game. It will never miss a chance to convert a winning line of its own, nor to block one or yours. Hence, the way to win is to create a situation where you can set up two lines of three with a single move such that the machine will only be able to block one. The program does not itself implement such a strategy, choosing squares on the basis of the best evaluation of any one line joined to that square, but not taking account of its effect on multiple lines. Given that the pro-

gram does not share the human difficulty of visualising all the possible lines, this makes a reasonably fair contest.

Implementation

Even on the Archimedes, the principal problem with this program was to make it run acceptably fast. In addition to the much quicker processor, program speed can be enhanced on this machine by making use of its large memory. The principle involved here is to perform as many calculations as possible in advance and save them as a file. The results can then be loaded into memory by the application program as a lookup table. This principle is incorporated into the present routines.

When 3D-DATGEN is run, the program appears to do nothing for about 10 or 15 seconds and then saves a data file to be read by the main program shown in 3DXO. What it is actually doing is to compute two tables which are used in the game. The first is simply the set of 495 possible winning lines, represented as sets of four numbers – 0 to 63 for each square in the cube. Most of the time, however, is used in creating the second look-up table from this. In order for the computer to play the game it will need to examine each of the 64 squares in turn and evaluate the consequence of playing in each – it can then choose randomly from among the squares tying for the highest evaluation. However, in order to evaluate each square the program must examine the current state of all possible winning lines of which each square is a member.

The integer array **linetable%** is dimensioned to have 64 rows and 11 columns. Each row represents a square in the cube and each column can be used to store the number of a winning line (as per the first table) of which that square is a member. Some squares are involved in fewer lines than others, so there entries are padded out with zeros as necessary. This table takes a while to compute since every square must be checked against all 495 winning lines. However, this program need only be run once and read from a data file into the main listing.

The main program, 3DXO, uses only the first table after a human move, checking the contents of the squares in each winning line for a possible four in a row. This is the process that took far too long to run in the Master version, but takes only a second or so on the Arc. Both tables, however, are used for the computer to play its own game. The machine strategy is as follows.

Prior to making its move, the program inspects all 64 squares, checking first if a square is already occupied (the cube is represented as a string of 64 characters initially set to blanks, and filled with X's and O's as the game progresses). Each unoccupied square is a potential candidate for a move and must be evaluated. The second look-up table is used to find the numbers of all straight lines associated with that cube. These in turn are looked up in the first table to find the numbers of the squares associated with each of these lines. The program then counts the number of X's and O's present in each line.

A maximum evaluation score is given to a line with three symbols belonging to the computer since filling the square concerned must complete a win. Next most highly rated is a line with three of the opponent's symbols in, since a move will block the other side from winning. Other evaluations are related to the number of symbols present. An existing line of two is rated higher than one which is higher than none. However, greater weighting is given to symbols of the computer's than those of the opponent since the program is on the move and can get one ahead.

The weakness of the program's strategy – as mentioned above – is that it looks only at the evaluation of the best line associated with a given square and takes no account of the effect of each move on other lines. There is obvious scope for strengthening the computer's play here if you feel it necessary. However, it should be apparent that even the present strategy requires a very large amount of computation to be performed. The fact that it all takes place in a couple of seconds is remarkable testimony indeed to the power of programming in Archimedes BASIC.

Where to get the disc

The 3D-OXO game is available on our Archimedes disc magazine issue Eight – see the advert in this issue. For more details see the order form in this issue of A&B Computing.

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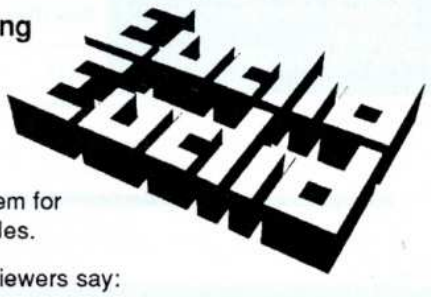

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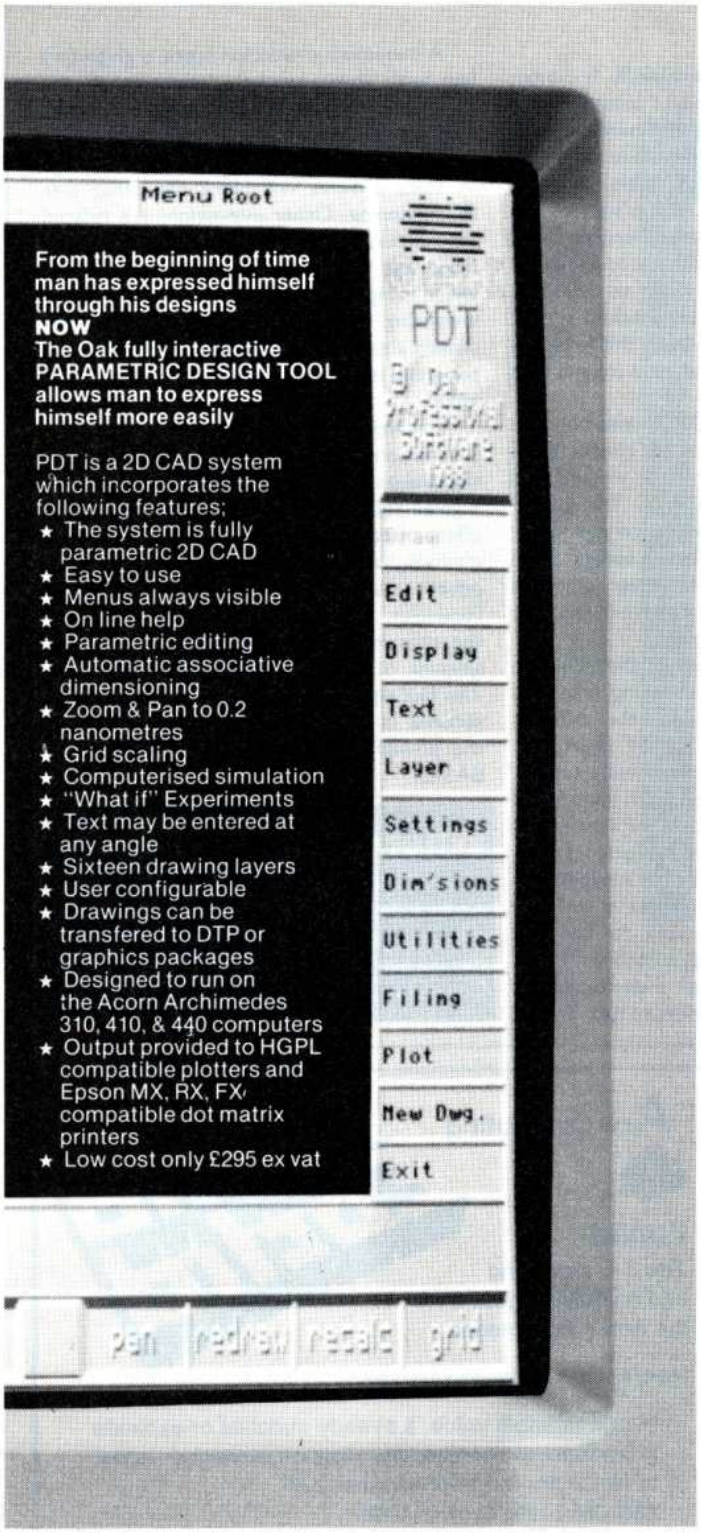
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3D Graphics — a bottomless pit of computer power

One of the most CPU-intensive tasks which a computer can be asked to perform is the calculation of a 3-D view of a solid object. Each picture can involve thousands of calculations and, in order to produce an animated sequence, these calculations have to be performed in a fiftieth of a second.

PROGRAMMING THE ARM

Paul Fellows

On a Model B, 3-D animation can only be achieved though the use of Machine code. The limit of what can be done is probably shown the Acornsoft game "Elite".

Since the Archimedes is many times more powerful than the Model B it provides the opportunity to produce impressive animations without resorting to assembly language. Of course, the potential for assembly language programs is even greater!

Drawing a 3-D object

The easiest way to draw a 3-D object is as a simple line drawing where a line is drawn for each edge of the object. This produces an image on the screen resembling the view of a hollow object composed only of wires joining the corners together. This type of drawing is known as a "Wire-Frame" drawing and the first program given here draws objects in this way. Obviously it is not very realistic since it takes no notice of the solid nature of the object. To draw a more realistic image requires not only filled-in sides to give a solid appearence but also removal of the parts of the object which are invisible because they are 'around the back'. The second program given here shows how the calculation of which surfaces are visible and which are not may be carried out.

Representing a solid object

In writing a program to do 3-D graphics, the first thing which must be done is to decide how the shape of the object is going to be represented numerically. When using the Wire-Frame mechanism for drawing the object all that is required is that we have a list of the 3-D coordinates of each of the corners of the object and a second list which tells us which corners should be joined to each other to form the edges of the object.

The first example program draws a Wire-Frame cube. The eight corners of the cube are defined in terms of their X,Y and Z positions relative to the origin, which is taken as the centre of the cube. Thus, looking at X,Y or Z, half of the points have a positive position and half a negative one. It is useful to have names for the corners of the object and to keep it simple I have lettered them A..H as shown in Diagram 1.

The coordinates of the eight corners are

X Y Z
A –200 200 200
B 200 200 200
C 200 –200 200
D –200 –200 200
E –200 200 –200
F 200 200 –200
G 200 –200 –200
H –200 –200 –200

In this case the object is very simple and each corner is connected to three other corners by an edge. This makes the job of describing the edges very simple. There are twelve of them.

1 AB; 2 AD; 3 AE; 4 BC; 5 BF; 6 CD; 7 CG; 8 DH; 9 EF; 10 EH; 11 FG; 12 GH.

This description of the cube is encoded in the DATA statements in the first example program.

Converting a 3-D shape into a 2-D view

Having obtained a numerical description of the object in three dimensions we need to be able to derive a set of 2-dimensional coordinates which can be used to plot the image of the object onto the screen. This process is known as "projection".

First, the example program sets up the variables NumberofPoints% and Numberof Edges% which help describe the object. Using these it sets up an array of world coordinates of all the points, each row of the array holds the X,Y and Z coordinate for a point.

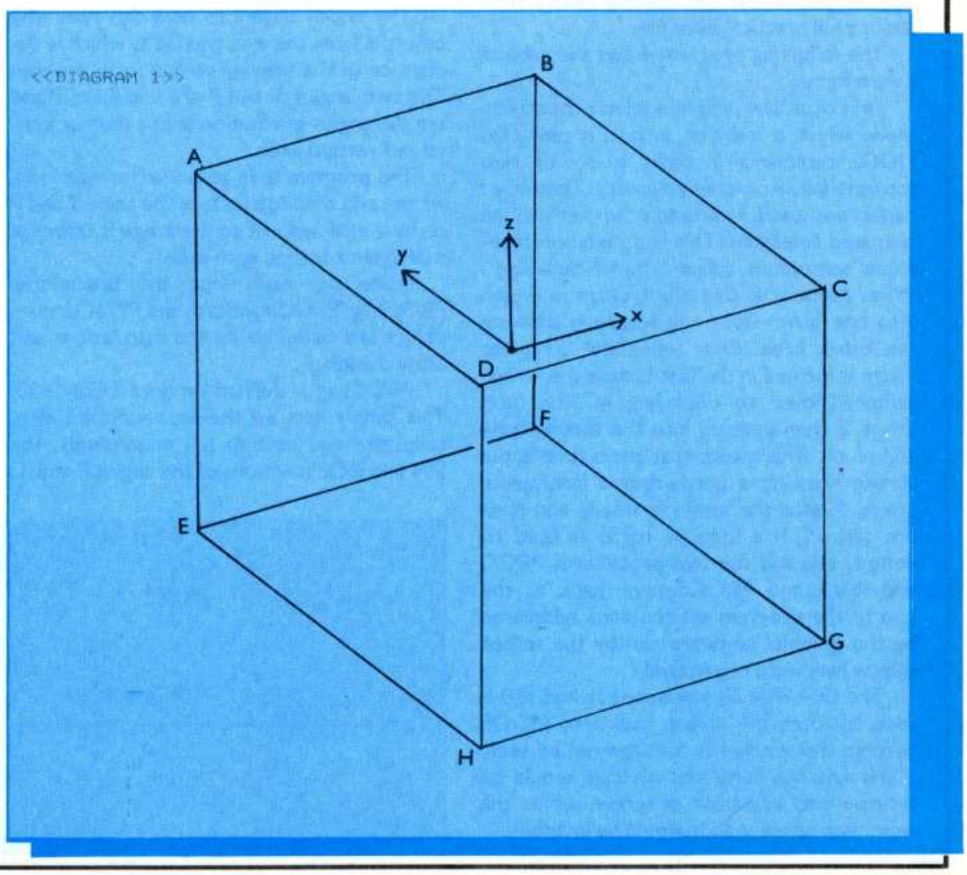
DIM World%(NumberofPoints%-1,2)

For any given point identified by N%, numbered from 0 to NumberofPoints%

X=World%(N%,0)
Y=World%(N%,1)
Z=World%(N%,2)

The program also uses an array of screen coordinates with the same number of rows by this time there are only X and Y co-ordinates.

DIM Screen%(NumberofPoints%-1,1)



Again, for the N%'th point
X=Screen%(N%,0) and
Y=Screen%(N%,1).

The process of transforming one set to the other can be divided into two phases. Firstly, there is the process of rotation and translation of the world coordinates of the object to give the desired position and orientation with respect to the eye position. This is known as the viewpoint transformation.

Normally, the points which make up an object are defined relative to some arbritary set of axes, with the origin of the axes at the centre of the object. The viewpoint transformation is the process of converting these co-ordinates to be relative to the position of the eye so that the distance from the eye is the Z coordinate. This involves two rotations and a translation as shown in diagram 2.

To do this in the program, the world coodinates of a point are multiplied by a matrix of sines and cosines of the two angles.

Xvp = −X*SIN(t) +Y*COS(t)
Yvp = -X*COS(t)*COS(p)
−Y*SIN(t)*COS(p) – Z * SIN(p)
Zvp = −X*COS(t)*SIN(p)
−Y*SIN(t)*SIN(p) – Z * COS(p) +Dist

Perspective

Secondly there is the projection onto the 2-D screen. This is known as the perspective transformation. It simply involves scaling the coordinates so that objects which are further away appear smaller. To do this we multiply by the ratio of the distance to the object and the distance to the screen. This is illustrated in diagram 3. #! H/h = Zvp/DS
Thus the scaling is just:–
Xscreen = DS/Zvp * Xvp
Yscreen = DS/Zvp * Yvp

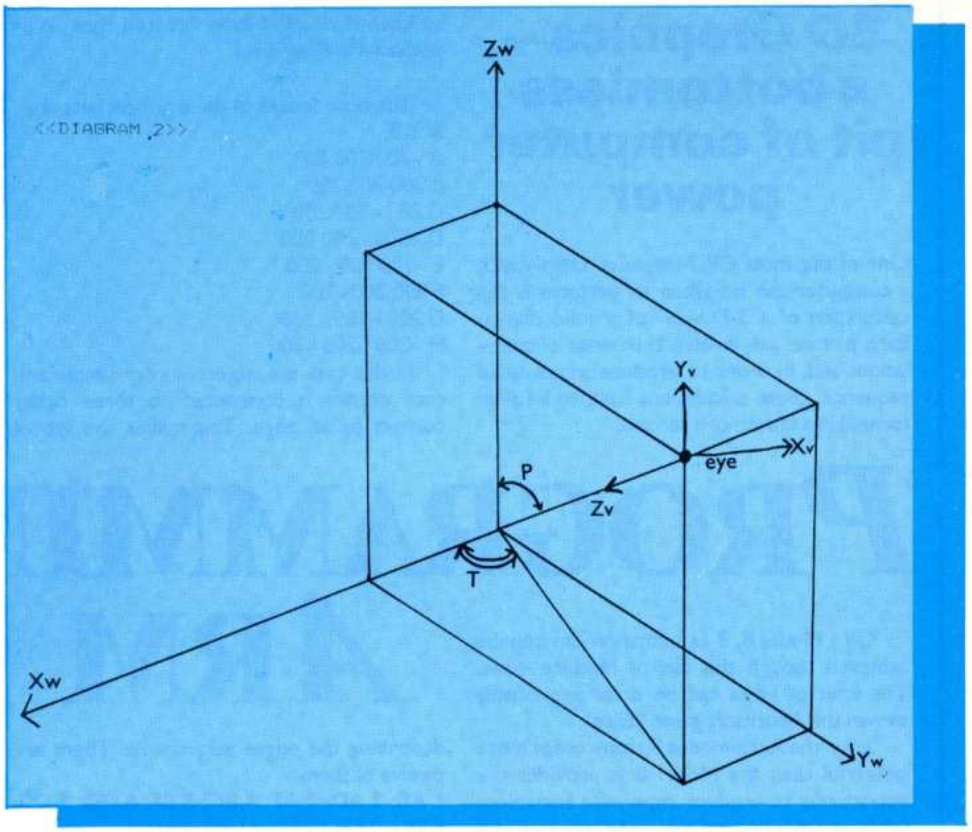
Wire-Frame Cube

So now we have all the building blocks, how about a full practical example.

The following program draws the cube as a wire frame.

First of all, the program selects the screen mode which it will use. In fact, it uses two MODE commands in order to set up two separate banks of screen memory. These two banks are used alternately to achieve an animated sequence. This is a common technique sometimes called "double-buffering". What happens is that the picture is drawn into one bank whilst the screen is showing the other bank. Only when the complete image is formed in the first bank is the screen switched over to displaying it. The next image is then built up into the second bank and so on. This means that at no time is the screen showing a partly-drawn incomplete image. Hence the image is steady and does not flicker. The variable tog% is used to control this and the two procedures PROC vdu−bank and PROCdisplay−bank at the end of the program set the bank addressed by the graphics software and by the screen display hardware respectively.

The ON ERROR statement at line 170 is used to force the screen back into MODE zero so that any error message can be seen. If this was not done, the message would be written into one bank of screen whilst the other was an view, so it would be invisible.



The program goes on to set up the two arrays which hold the description of the object in 'world' and 'screen' coordinates. The number of points (in this case 8) being read in from DATA on line 310 and the co-ordinates of the points from the next eight lines. These are in the order X,Y,Z.

The program then reads in the number of edges and then pairs of letters identifying the pairs of points which mark the ends of the edges.

Next, the program sets up the variable DIST% which describes how far away the object is from the eye, and DS% which is the distance of the viewing screen from the eye. The two angles T and P are initialised these are the angles of rotation about the horizontal and vertical axes.

The program then goes into its main loop. At the end the loop it steps the angle T and P on by a small amount so the image is drawn at a different rotation each time.

Inside the main loop the procedures PROCtrig, PROCtransform and PROCdraw−object are called to do the calculations and draw the image.

PROCtrig is defined on lines 1420-1450. This simply sets up the four variables sinp, cosp, sint and cost to be, respectively, the SIN and COS functions of the angles P and T. This is so that they don't need to be calculated every time they are needed and helps the program go faster.

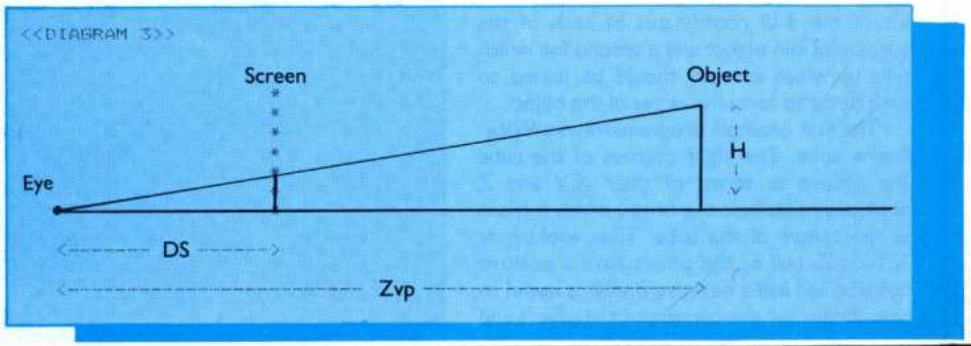
The most complicated procedure is PROCtransform. This carries out the computation of the screen coordinates of every point. It acts in two stages. Firstly it does the viewpoint transformation. This is on lines 1030-1080, the coordinates of each point in the World%() array are extracted into X%, Y% and Z% and then transformed to give the viewpoint coordinates Xvp,Yvp,Zvp.

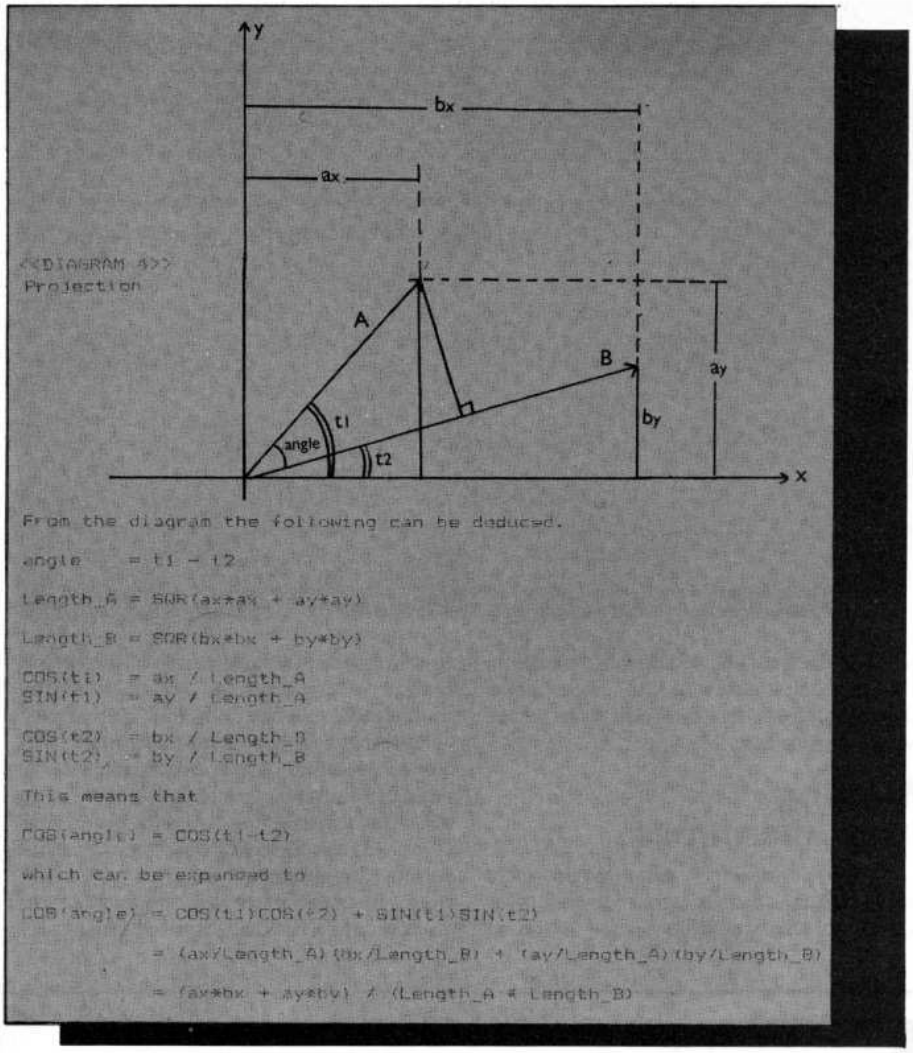
The second stage is to apply the perspective scaling. The is done on lines 1090-1110. The screen X and Y coordinates are simply Xvp and Yvp multiplied by D, which is the ratio of the distance to the screen and the distance of the point, Zvp.

All that remains now is to draw the object from its screen coordinates. This is done by PROCdraw−object which calls PROCdraw−egde 6 times, once for each edge. This in turn calls PROCmove−to and PROCdraw−to to draw a line.

Solid Surfaces

Obviously, the wire-frame view of the object satisfies our requirement for a 3D view of the object but the word "SOLID" is not





really applicable. The problem of making the shape appear as a solid rather than a hollow frame is a very complicated one. It requires that the computer only draws those parts of the object which are not obscured by other parts nearer to the eye. The method which follows relies upon the fact that the shape is convex, that is there are no nooks and crannies on the surface of the object. This simplifies things a great deal since it means that a surface is either completely visible or completely hidden. We do not have to worry about partly obscured faces.

The technique illustrated by the second example is known as "Backsurface Elimination". It relies upon the simple fact that a face can be seen if it is tilted towards the eye, but cannot be seen if it faces backwards.

The cube again...

In the first example the cube was represented by a set of eight points and a set of twelve edges. In order to achieve a solid object we must replace the use of edges by data describing the faces of the object. In fact, because the Operating System can draw triangles but not arbitrary 4-sided polygons, it is necessary to cut up each face of the object into a number of triangles. This is very easy for the cube, each face is made up of just two triangles. The cube has got 6 faces and therefore 12 triangles are needed.

These are: 0 ADB; 1 BDC; 2 BCG; 3 BGF; 4 CDG; 5 GDH; 6 DEH; 7 DAE; 8 BEA; 9 BFE; 10 EGH; 11 EFG.

Representing the faces

An array is again used to hold the sets of three numbers which identify the points at the corners of each face. This replaces the Edges%() array in the Wire-Frame example.

DIM Faces%(NumberofFaces%-1,2)

Each row of the array corresponds to a particular face, the three elements of the array hold the numbers corresponding to the three corners which describe the face in a special order. This order is such that if you visited each one in turn you would appear to be travelling anti-clockwise when viewed from a point outside the object and directly above the face in question. This is important when calculating whether a face can be seen or not, it is used to determine in which direction a face is tilted.

Determining the direction of tilt relies upon the calculation of the direction of a line which stand straight out from the face at right-angles. This is called the "normal". If this "normal" points towards the eye then the face can be seen otherwise it must be "around the back" and should no be drawn.

In fact we use another line going from one corner of the face to the eye. If these two lines go in the same general direction the face should be drawn. How can we decide whether the two lines go in the same direction? One answer is to see if the angle between the two lines is between 0 and 90 degrees. If it is, the lines are roughly going the same way but if the angle is more than 90 degrees then they are going in opposite directions. An even shorter way to say this is that the COS of the angle must be greater than zero. DIAGRAM 4 shows how the angle between two lines can be deduced for a simple 2-D case. The result for the COS of the angle is a supprisingly simple formula. In the 3-D case the result remains just as straightforward with the addition of just one extra term.

COS(angle) = (ax*bx + ay*by + az*bz)/ (Length−A * Length−B)

Illumination

The final thing which must be done is to choose the colour to use for the face. The process which I have used is a very simple one which relies upon the same projection technique as is used for calculating the direction of a face. The example tries to give the impression that the object is illuminated from a light source at the position of the eye. This means that objects which are directly facing the eye will appear brightest. As the angle between the face-normal and the eye increases the intensity of the light is decreased. In fact, it can be shown that for a matt surface, the observed intensity is related to the COS of this angle. This is very convenient since the calculation of the projection has already given us the COS of the angle.

In the second example program the variable 'drawface' is calculated on line 1190 and is actually COS(theta). This is used to pick one of the sixteen shades of grey which have been set up in the palette.

The program in listing 2 draws a solid cube. It follows the same structure as the wire-frame example but uses faces instead of edges to represent the object. The procedure PROCdraw−solid−object is a lot more complicated than the simple procedure in the wire-frame program. It considers each face in turn and decided whether to draw it or not, and if it is to be drawn what shade of colour to use. In order to highlight the fact that the faces are split up into triangles the program draws a black outline around the triangles. This can easily be removed by deleting lines 1320 and 1330 so that PROC draw−face is not called.

Lines 1100-1120 extract the three points p0%,p1%,p2% which mark out the edges of the face in question. These are then used to construct the values e1x%,e1y%,e1z% and e2x%,e2y%,e2z% which represent vectors (lines) running from one of the corners of the face (p0%) to each of the other two corners (p1% and p2%). This is illustrated in DIAGRAM 5.

These two vectors are then used to compute the normal vector by a mathematical technique called the taking the 'vector product'. This is also sometimes called the 'cross product'. What this essentially does is to say that the normal vector (the one at right angles to) two other vectors is such that its components are as follows.

Normal X = Y1 * Z2 − Z1 * Y2
Normal Y = Z1 * X2 − X1 * Z2
Normal Z = X1 * Y2 − Y1 * X2

I won't try to explain why this gives the normal vector but, as each direction is made up from the products of parts of the other two vectors from the other two directions, it seems reasonable that the overall direction is at right-angles.

Having calculated the normal, we need to know whether it points towards or away from the eye. This is done by applying the dot-product trick which I described earlier. First we calculate the vector from one corner of the face (p0%) to the eye. This is done on lines 1240-1260. Then we need to calculate the projection of the normal vector onto this vector to see if it points towards or away from us. This is done on line 1190 in the first part of the rather complicated expression. The essential part of it is

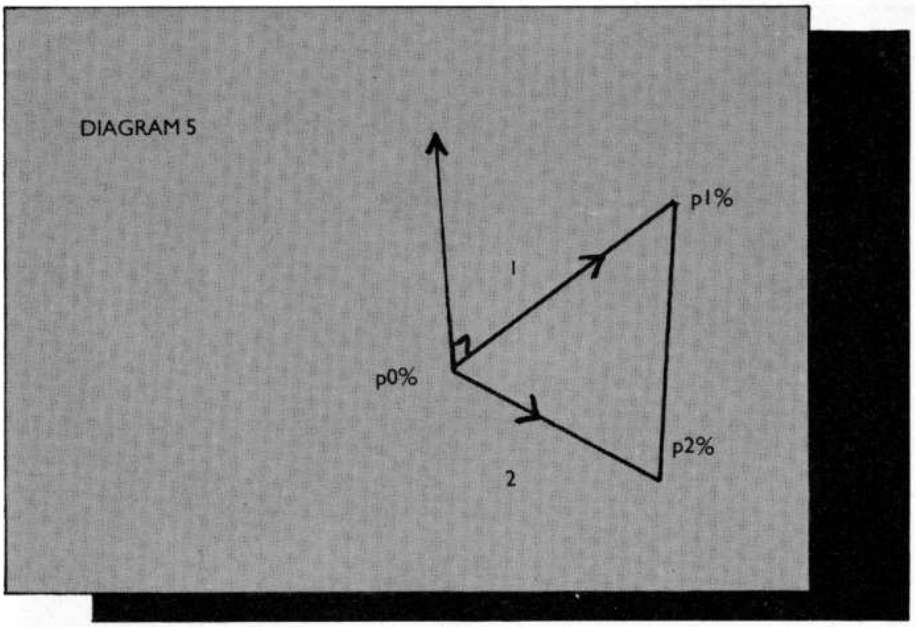
NX% * eyeX% + NY% * eyeY% + NZ% * eyeZ%

If this gives a positive result then the face points towards us and should be drawn, if not it points away from us and is hidden. This test is made on the next line.

The second part of line 1190 calculates the lengths of the two vectors (NX%,NY%, NZ%) and (eyeX%,eyeY%,eyeZ%) using pythagorus' theorum. This is then used to scale down the number so that it is in the range 0-1.

If the face is to be drawn, this scaled number (drawface) is used to choose a colour. The higher the value, the higher the colour number which is used and hence the brighter the face will appear on the screen. This gives the effect of the object being illuminated from the direction from which we are looking at it.

DIAGRAM 5



Making improvements

The first thing which you might do would be to change the direction of the light-source. All that would be needed would be to calculate another projection of the normal onto a vector from the face to the light source and to choose the colour accordingly.

Alternatively you could experiment with more interesting shapes. For example a flat-sided cylinder can quite easily be made using triangular faces. If you do try to enter your own shapes be careful to obey the rule about entering the points for each face in the anti-clockwise order. If you don't do this the program will think the shape is partly inside-out.

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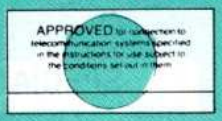
If you thought £150 didn't buy much of a modem you haven't heard about the aries 1200

NEW

Aries 1200 MODEM



Up till now buying a modem was a compromise between price and performance, but the new Aries 1200 offers performance and features not found on modems costing two or three times as much. Look at the features offered by the Aries 1200, features which you wouldn't expect from a modem at this price – and some which you would be lucky to find on a modem at any price.

- Operates in V21 (300/300), V23 (1200/75 and 75/1200) and proprietary V23 1200 mode.
- Connect it to any type of computer or terminal via the 25 way serial D connector or the BBC standard 5 pin Domino socket.
- A built in phone socket means your phone plugs straight through.
- A reset switch so the hardware makes it easy to restart – even when your software doesn't.
- Industry standard Hayes (C) compatibility means that this is one of the easiest modems to use. It can automatically work out the speed your computer is working at, and even the speed and protocol of the modem at the other end.
- Auto Call mode can dial using tone or pulse (the modem works that out too), and when it connects it will automatically determine the speed of the answering modem.
- Auto answer mode means the modem can be left unattended to answer calls from other modems, and of course it automatically works out the speed and protocol of the calling modem.
- The built in speaker and front panel LED's mean that you always know what the modem is doing.

. . . Features at any price.

- Proprietary V23 mode mean that two Aries 1200's can communicate at 1200/1200 and in this situation you can take advantage of the built in data compaction which reduces the volume of text you send by 30%.
- Built in scrambler means that data transferred between two Aries modems is automatically encrypted. The encryption code can be used defined for a totally private email system.
- User defined control commands means that the Aries can even be used from a dumb terminal or with non standard software.
- Front panel light include indicators for Power, Auto Answer Mode, Transmit, Receive, On line, Terminal ready and Carrier Detect. There's even an indicator to show the quality of the phone line.
- Internal watch-dog monitors the modems activity and in the event of a power failure or computer crash it automatically resets the modem. The Aries modem can never hold open your phone line or lock up your computer.
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GRAPHICS PACKAGE

Imagine Quest Paint re-written to take advantage of the high resolution of Mode 0, well this is it. The Wapping Editor could well be worth buying for this section alone. This must surely be the graphics.

WORD PROCESSOR

This section is a fully functional word processor specially tailored to suit the Desktop Publishing environment. Gone are all the unnecessary and cumbersome text formatting commands – these are dealt with in the 'Page-Layout' section. The features of this word processor include wordwrap, wordcount, insert/overwrite, move block, copy block, delete block, search and replace, browse, etc, many of these features being mouse controlled. Text input can of course be taken from existing word processor files like Wordwise, View, etc, but it is not necessary to have a separate word processor in order to use this package.

PAGE-LAYOUT SECTION

Page Layout becomes easy using these mouse-driven routines. The user simply 'pulls' a rectangle onto the page and states which text document or graphic is required to fill the space – it's as simple as that! Text can be automatically printed in a pre-set number of columns, left justified and/or right justified, or centered. Several different typefaces can be held in memory at one time. Graphics may be stretched, squahsed or cropped to fit any size rectangle. Graphics input can be from the software provided in the package or, using the 'mode convert', from any graphics mode screen.

THE FONT EDITOR

This is an enhanced version of the font editor contained in the Con-Quest ROM and allows the editing of ALL 95 characters. As well as being able to design your own typefaces, fonts from other DTP packages or from Quest Pain may be loaded into the editor and converted for use with the Wapping Editor. This sophisticated editor has numerous functions including slide, flip, invert and rotate individual characters or the whole font. Individual characters can be mirrored or copied and a mask feature allows you to superimpose two characters. Lines and columns can be inserted or deleted allowing the character to be stretched or squashed. This font editor will also allow 'font' and 'brush' files to be designed for use with Quest Paint.
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To use other co-processors you require a BBC B with DNFS 1.20 or higher, or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly like a second processor.

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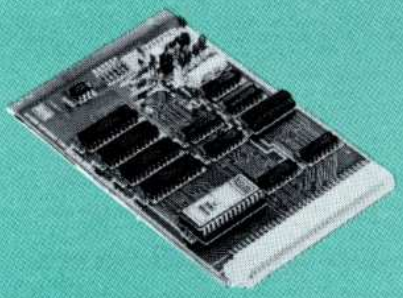
Archimedes Real-Time Digitiser



Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air television signals may also be digitised via a video recorder or TV tuner.

Once captured, Video images can be stretched, squahsed, rotated, stored on disk, printed, or used by applications software.

Applications include desktop publishing, graphics, animation, image analysis and recognition, medical imaging, automatic inspection and measurement, databases, interactive video, remote transmission of pictures via a modem, movement detection ... or anything else you can think of!

SPECIFICATION

SOFTWARE

All the driver software for the digitiser is contained in a ROM on the podule. Facilities provided include:

- Grabbing of images to the screen or dumping to memory.
- Continuous grabbing and display for previewing or camera alignment.
- 'Hot key' grabbing – pressing a (configurable) key combination grabs and displays an image on the screen while another program (e.g. paint software such as Artisan) is running.
- Scaling (zoom/shrink) any section of an image to any size in X and Y directions, with optional X/Y flip, window clip and logical (AND/OR/XOR) plotting.
- Rotation and scaling to any angle and size, rotating about any point, with optional window clip, and logical (AND/OR/XOR) plotting.
- Very versatile matrix printer screendump facility for Epson FX, LQ and EX compatible printers – pictures can be printed to ANY size (including multiple sheets) at any orientation, using any available printer density and one of six internal sets of dot patterns, or with user definable patterns (pattern editor supplied). The screen-dump can also be used for general purpose graphics screen printing.
- Pixel value lookup tables: pixel values can be passed through a user defined lookup table to allow contrast enhancement, thresholding, pseudo-colouring etc.
- Smoothing and noise spot removal to enhance image quality.
- Creation of sprites from all or part of a digitised image.
- Saving and loading of digitised images in compressed format.
- Combination of pictures by adding, avaraging, subtracting, multiplication etc.
- Much faster versions of the Arthur *ScreenLoad and *ScreenSave commands.

Software facilities are accessed via operating system star (*) commands and SWI calls. High resolution screen modes using MultiSync type monitors are supported.

UTILITY DISK

A disk is included, containing sample pictures, examples and utility programs including the following:

- Colour image grabbing using colour filters with monochrome or colour cameras, including colour balance adjustment and scaling facilities.
- Pattern editor for 2 colour display modes and printer screendumps.
- 512 line interlaced display for non MultiSync monitors.
- Thresholding to create two colour images.
- Capture and replay of animated sequences.
- Several example programs illustrating the use of digitiser software.

RESOLUTION

Images are digitised to 512 (h) x 256 (v) pixels, and then scaled to fit the Archimedes' screen. It is possible to digitise to 512 x 512 pixels if the picture is stationary for about 0.1 second. 512 x 512 images can either be displayed on a MultiSync monitor, or on a normal monitor using interlacing.

Pictures are digitised to 64 levels of grey (6 bits). Note, however, that it is only possible to display all 64 levels on a monochrome monitor, or a colour monitor which has a composite (CVBS) input. For this reason, the Philips CM8533 monitor is recommended instead of the standard Archimedes monitor. It is also possible to connect both a colour and a monochrome monitor at the same time.

Any 2,16 or 256 colour graphics mode can be used to display digitised pictures. In two colour modes, grey levels are represented using dot patterns, which may be redefined if required (a pattern editor is supplied).

Cont.

SPEED

Video fields are captured in real time (1/50th sec.), and then transferred to Archimedes' memory or the screen. The grab/display rate is dependant on the screen mode and picture size, up to 25 fields per second for quarter screen images, or 12.5 per second for fullscreen (Mode 9).

HARDWARE

The digitiser is a single width podule, with a BNC socket on the rear panel for the video input, which may optionally be terminated via a link. There is 128K of on-board memory to store the digitised image, and a 32K ROM on the podule contains all the driver software.

Automatic video level control and black level clamping circuitry is used to ensure that the optimum contrast is obtained from a variety of video sources. A filter is included to avoid patterning effects when using colour sources.

Price £249

Watford Electronics are Appointed & Authorised DEALERS / REPAIR CENTRE for Acorn Computers Ltd Microvitec Monitors Panasonic Printers

Watford Dealers' List

UNITED KINGDOM

Alpha Microtec Ltd, 321 Stratford Road, Shirley, Solihull, West Midlands. Tel: 021-745 8998.

Badger Micros (Devon), Badger's Hill, Southerton, Ottery-St. Mary, Devon EX11 1SE. Tel: 0395 68516.

Beebug Retail, Dolphin Place, Holywell Hill, St. Albans.

Cambridge Computer Store, 4 Emmanuel St., Cambridge CB1 1NE. Tel: 0223 358264.

Cirkit Distribution Ltd, Park Lane, Broxbourne, Herts.

C.J.E. Micros, 78 Brighton Road, Worthing, West Sussex. Tel: 0903 213361.

HCCS, 575-583 Durham Road, Low Fell, Gateshead, Nr. Newcastle Upon Tyne. Tel. 091 4870760.

Mancomp Ltd, Printworks Lane, Levenshulme, Manchester. Tel: 061-224 1888-9888.

Microman Computers, Pasture Lane Farm, Pasture Lane, Rainford, St. Helens, Merseyside WA11 8PU. Tel: 074488 3667.

The Computer Depot, 205 Buchanan Street, Glasgow G1 2JZ. Tel: 041-332 3944.

Verospeed Ltd, Boyatt Wood, Eastleigh, Hants.

OVERSEAS DEALERS

*Absolute Electronics, Rewal House, 208-210 La Trobe Street, Melbourne, 3000, Victoria, Australia. Tel: (03) 663 2411.

Alpha Computer Co, Shop 314 Chi Fu Commercial Centre, Chi Fu Fa Yuen, Hong Kong, Tel: 5-506592.

Computer Distribution Company, Parklaan, 47, 8-9300 Aaist, Belgium.

E.B.N., Elisenstrasse 13, 1000 Berlin 41. Tel: (030) 7952057.

Lendac Data Systems, Unit 31, IDA Enterprise Centre, Pearce Street, Dublin 12. Tel: 710796.

Lindis International Ltd, Wood Farm, Linstead Magna, Halesworth, Suffolk. Tel: 098 685 476.

Scientex P.V.B.A., Zilversmidstraat 2, B-2000 Antwerpen, Belgium, Tel: 03 233 59 06.

Techno-matic Data, Holbergsgade 19, 1057 Kobenhavn K, Denmark.

*Velobyte, Scheaedyksadyk 5a-6a, 3011 EB Rotterdam, Holland, Tel: (010) 413 8197/414 5171.

Viking Tecno, Vestergade 12.1, 9620 Aalestrup, Denmark, Tel: 08 642522.

*Acorn/Watford Referral Centres.

Continued

MONITORS & SWIVEL BASES

All Monitors are supplied complete with BBC connecting leads FREE.

MICROVITEC 14"

- 1431 – Standard resolution as used on the BBC television computer programme **£175**
- 1451 – Medium resolution, suitable for word processing in mode 0 **£219**
- 1441 – High res, exceeds the capabilities of the BBC micro **£359**
- 1431AP RGB + PAL and AUDIO **£199**
- 1451AP RGB + PAL and AUDIO **£255**
- **2030 CS 20" Med Res** **£380**
- **2040 CS 20" Hi Res** **£675**
- Dust Cover for Microvitecs **£5.50**
- **Touchtec 501 Touch Screen** **£239**

TAXAN 12" & 14"

- **TAXAN Super Vision 2 Type 620** Hi-res RGB Colour monitor. Ideal for Wordprocessing **£263**
- **TAXAN Super 3, Type 625** Ultra Hi-res, RGB Colour) Text mode switch allows monochrome text display in Green, Amber, White reverse or White on Blue **£313**
- **TAXAN 14" Multisync 770 Plus** – An autoscanning Ultra high res, colour monitor. Ideal for Archimedes, IBM & Compatibles **£479**

- **NEC JC-1402P 14"** Multisync II Ultra Hi-res Intelligent Colour monitor. Auto scans frequencies between 15KHz to 35KHz. Text switch provides 7 colours for Database & wordprocessor. **£475**

PHILLIPS

- BM7502 12" Hi-res Green Monitor **£65**
- CM8833 14" Med. Res Colour Monitor **£219**

STAR BUY

- **PHILLIPS 14** Medium Res, dark glass, attractively finished Colour Monitor – supplied complete with RGB, SKART and Audio/Phono Inputs. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display. (Please state the type of Connecting Lead you require).

ONLY £195

Dust Cover for Phillips Monitors **£6**

NEW

SPECIAL OFFER
AMBER MONITOR

BT MERLIN/Acorn 12" Hi resolution Amber monitor. Ideal for wordprocessing. Consealed front panel mounted controls. Illuminated mains on/off rocker switch. Supplied complete with BBC Cable.

Only £49
(Offer valid while stocks last)

N.B. carriage on Monitors **£7** (securicor)

A range of IBM PC Compatible monitors, both monochrome & Colour are now available. Please write in for our descriptive PC brochure.

SPARE LEADS

BNC Lead for Zenith or Philips	**£3**
Skart Monitor Lead	**£5**
RGB lead for TAXAN Monitors	**£3**
Archimedes Colour Monitor Lead	**£7.50**

SWIVEL BASES

By placing your monitor on one of our professional swivel bases (see monitors drawing on the left), you gain the freedom to adjust the monitor viewing angle to suit your needs and thus alleviate eye strain and reduce back stress. The front mounted adjustable control dial makes adjusting the monitor viewing angle very simple.

for 12" Monitors **£7** (carr. £2.50)
for 14" Monitors **£10** (carr. £2.50)

Anti-Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for all wordprocessor users. Hundreds of these screens are in daily use in various branches of one of the leading High Street banks.

£12

TAXAN KP-815 PRINTER

80 column, Bi-directional, 160 CPS, (NLQ 24cps); Friction & tractor feed + paper roll holder as standard; Epson FX compatible.

Offer Price £155

Taxan KP915 132 Column Printerr (carr £7)	**£275**
RS232 Interface	**£49**
RS232 Interface with 2K Buffer	**£69**
RS232 Interface with 16K Buffer	**£89**

Panasonic KX-P1081

Attractively finished in BBC beige. Bi-directional, logic seeking. Has IBM and Epson RX compatible command calls. Speed: 120CPS draft mode, 24 CPS NLQ mode. Character width range from 5 cpi to 17 cpi. Upto 40 downloadable characters. Functions include, Proportional spacing, Justification, centering and left & right ranging.

(Price inludes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).

Special Price: **£145** (carr. £6)
Optional RS232 Interface: **£39**

Panasonic KX-P3131 Daisy-Wheel Printer

Low-cost, high performance; Bi-directional, Logic seeking, Proportional spacing, 10, 12 & 15 CPI, Speed 17CPS. 6K Buffer.

Only **£255** (carr. £7)

Tractor Feed	**£90**
Daisy Wheel (various)	**£12**
Ribbons: Standard **£4.50**; Long Life **£7**	
Extra 32K Printer Buffer (internally fitted)	**£13**

RS-232 GENDER CHANGERS

Male to Female	**£6.95**
Female to Male	**£6.95**
Male to Female	**£6.95**

Panasonic KX-P4450 LASER PRINTER

Latest technology at affordable price. Prints 11 pages a minute, Two A4 size paper bins, Serial & Parallel ports, 512K Buffer – expandable to 1.5Meg, 15 Character LCD Display, Diablo 630, Epson FX-286, IBM Proprinter, HP Laserjet emulations, 5K pages per month duty cycle.

ONLY £1,469
Toner for KX-P4450 **£29**

NEC P2200 PINWRITER

24 pin; 80 column; 168CPS – 56CPS LQ; Epson LQ compatible, 7K Buffer; 7 resident FONTS, Friction & Tractor feed, front load single sheet feed, etc.

Price: £269
FREE Price includes a Free BBC Cable.

Cut Sheet Feeder	**£59**
Pinwriter Serial Interface	**£55**
Additional Font Cartridge	**£25**
NEC P2200 Pinwriter Ribbon	**£6**

NEC PINWRITER P6/P7 Plus

The Ultimate matrix Printer for Business.

24pin printhead; Print speed, 265cps Draft, 90cps LQ; Inbuilt Tractor & Friction feed; A paper park & low tear facility; 20 inbuilt FONTs; A font cartridge facility; 8K of printer buffer; colour option available.

P6 Plus 80 columns	**£439**
P7 Plus 136 columns	**£575**
Cut Sheet Feeder	**£125**
Colour Option	**£74**
Serial Interface	**£73**

EPSON PRINTERS

EX800	**£405**	LQ850	**£469**
EX1000	**£545**	LQ1050	**£585**
FX850	**£315**	LQ2550	**£899**
FX1000	**£425**	LX800	**£175**
GQ3500 Laser	**£1249**	SQ2500	**£975**
LQ500	**£285**		

Star LC10 £185 **LC10 Colour £229**

PLOTTERS

Hitachi 672 Colour Plotter	**£475**
Plotmate Plotter A4S	**£379**
Plotmate Plotter A3M	**£549**

CUT SHEET FEEDERS for
EX800 **£149**; EX1000/LQ2550 **£210**; FX800 **£149**; FX1000 **£179**; LQ/LX800 **£139**; LQ500 **£75**; LQ850 **£135**; LQ1050 **£175**.

TRACTOR FEED for
EX800/1000 **£85**; LQ800 **£44**; LQ850 **£69**; LQ1050 **£85**; LQ2500 **£195**

ACCESSORIES

- EX800/1000 Colour Option **£55**
- EX800/1000 Colour Ribbon **£18**
- LQ2500 Colour Option **£65**

(Securicor Carriage on Printers £7

EPSON PRINTER INTERFACES

All these interfaces fit inside the printer.

RS232	**£32**	RS232 + 2K Buffer	**£52**
IEEE 488	**£40**	RS232 + 8K Buffer	**£79**

Universal Printer Sharers/Changers

Connect upto 5 Micros to 1 printer or 5 Printers to 1 Micro with our combined, Sharer/Changer. These Units are made to a very high standard. For extreme reliability, they all have Printed Circuit Boards mounted inside the case, (not a Spagetti Junction of wires). Internal connection is made via high quality ribbon cables.
(Ideal for School environments.)

Connects	Serial	Centronics
2 to 1	£22	£23
3 to 1	£30	£32
5 to 1	£40	£42

(Cables extra at £6 each. Please specify type required when ordering)

INTEGREX COLOUR JET PRINTER

● Colour Jet 132 Printer	£515
● Paper Roll	£6
● Screen Dump Software	£10
● Colour Cartridge	£14
● Black Cartridge	£8
● 100 A4 OHP transparencies	£55
● 8K Serial Interface Optional	£99

Professional Printer Stand

This new professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

80 Column version £23 (carr. £2.50)
132 Column version £26 (carr. £2.50)

PRINTER LEADS

BBC Centronics 4' long	£5
BBC Centronics 6' extra long	£7
Compact's Special Centronics Lead	£7
Archimedes Printer Lead 1 meter	£7
IBM Parallel Lead 1 meter	£7
Double Ended 36 way Centronic Lead	£9
RS232 Leads (Various)	P.O.A.

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
BBC Micro	–	£3.50
BBC Master	–	£4.00
Archimedes Micro pair	–	£9.00
IBM PCs pair	–	£6.00
Brother HR15/20	£3.00	£5.00
DMP2000	£3.75	£4.75
EX/LQ800	£4.50	£4.50
EX/LQ1000	£7.50	£5.00
RX/FX80/85/800/MX80	£3.90	£4.95
RX/FX100/1000	£5.75	–
Kaga/Taxan KP810/815	£4.90	£4.00
LC10 (Black)	£4.25	£5.00
LQ500/800	£3.75	£5.00
LQ1050/LQ2500	£8.50	£5.50
LX80/86/800	£3.80	£4.50
M1009/GLP	£3.80	£3.75
Panasonic KX1080/81	£4.00	£4.75
SQ2500	£23.00	£5.50
Star NL10	£3.75	£4.50
Olivetti Ink Jet Cartridges (set of 4)	£9	

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Listing Paper (Perforated)

● *1,000 Sheets 9½" × 11" Fanfold Paper*	*£7*
● *2,000 Sheets 9½" × 11" Fanfold Paper*	*£12*
● *1000 Sheets 9½" × 11" NCR 2 Part Fanfold*	*£19*
● *1,000 Sheets 15" × 11" Fanfold Paper*	*£9*
● *1000 Sheets true A4 Fanfold Paper*	*£11*
● *2000 Sheets true A4 Fanfold Paper*	*£19*
● *Teleprinter Roll (Econo paper)*	*£4*

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50. 2K Sheets £3.00

PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 × 36mm (Single Row)	*£5.00*
1,000 90 × 36mm (Twin Row)	*£4.90*
1,000 90 × 49mm (Twin Row)	*£7.50*
1,000 102 × 36mm (Twin Row)	*£6.25*

Carriage on 1,000 Labels £1.00

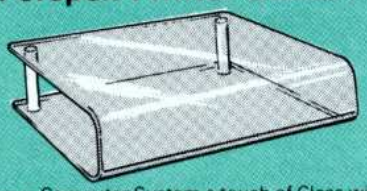
PLINTHS FOR BBC MICRO, MASTER & PRINTERS

Protect your computer from the heat of your VDU. Our micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and VDU, whilst the double height version provides enough room for our stacked disc drive and other peripherals like, Eprom programmer, music unit or simply discs & stationary. The computer slides neatly in the lower section allowing easy access to remove the lid.

The single printer stand is equally sturdy but instead of cooling slots it has elegant cutouts on the sides. This allows easy access to paper from all sides. Colour: BBC Beige.

Single BBC Plinth	**£12** (carr. £2)
Double BBc Plinth	**£20** (carr. £3)
Printer Plinth	**£12** (carr. £2)
Single Master Plinth	**£13** (carr £2)
Double Master Plinth	**£24** (carr £3)

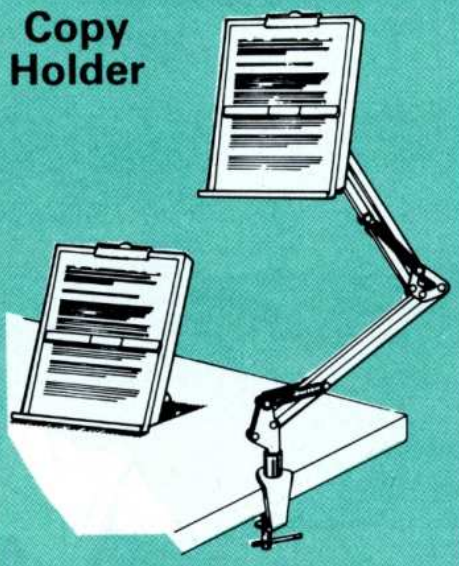
Perspex Printer Stand



Give your Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand. The printer sits on top and the fanfold paper rests neatly underneath, thus occupying the same space as the printer footprint.

Only: £16 (carr. £3)

Copy Holder



Whether you want to type in your latest program or the draft of a new trilogy, Watford's manuscript holders are superb for holding your paper at the ideal height and angle to allow you to read and type in ease and comfort.

Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly by means of a plastic retaining ruler and a clip grip. (for resting books or magazines, the desk top version is recommended).

Desk Top **£10** (carr. £2)

Angle poise **£14** (carr. £3)

MEGABUFFER 256

The Smallest 256K Printer Buffer Unit in the world 38mm x 130mm x 134mm.

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:

- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

Only £149 (carr £2)

OKIMATE COLOUR PRINTER

The first ribbon transfer printer in its price range which offers fully versatile colour or black printing. A 24 element print head produces more than 100 shades with exceptional clarity. Ideal for use with Quest Paint or AMX Super Art.

Only: **£119**

BBC Screen Dump	£10
Colour Ribbon	£6
Black Ribbon	£6

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible Printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from BASIC and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

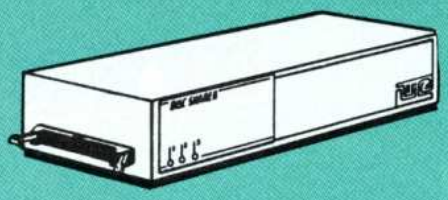
£5.95 (No VAT)

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

Continued ——→

NEW

DISC DRIVE SHARER



(Ideal for educational establishments)

At last, a low cost alternative to the Econet system. Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Launch Price: **£65** Price includes 3 Cables

NOW WITH EXTRA FEATURES AT NO EXTRA COST – Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for six years and has gained a large following amongst serious and educational users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. ***(P.S. Watford's highly sophisticated DFS is fully compatible with Acorn standard DFS). (while Acorn's 1770 DFS is fully compatible with Watford's Mk II DDFS)***

- *Complete Disc Interface Kit including DFS ROM and fitting instructions* **£48**
- *Acorn's 0.90 DFS Kit complete* **£49**
- *DFS Manual (Comprehensive)* *(no VAT)* **£6.95**

(P.S. Our DFS manual is the only comprehensive Manual available for the BBC micro and covers both Acorn & Watford DFSs).

- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *DNFS ROM only* **£17** • *ADFS ROM only* **£25**

NEW

Watford's MkII 1770 Double Density DFS Interface

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1770 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features:

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!

If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£30.00.**

- Special introductory offer **£39.00**
- DDFS Manual (No VAT) **£6.95**
- We will exchange your existing DFS Kit for our sophisticated DDFS for only **£25.00**

Please note, as the MkII DDFS is a hardware and software upgrade, it is not possible for existing Watford DDFS users to simply exchange their ROM for the new version.

DUST COVERS (For our Disc Drives)

Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

Special 40/80 Disc Drive/DDFS Mk II Offer

- The popular 40/80 track 400K single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's extremely popular DDFS Disc Interface (allows 720K storage). Will run in both, Single & Double Density modes.
- A comprehensive User Friendly Manual.

A Bargain at Only **£125** (£6 carr)
(Offer valid while stocks last)

3½" DISC DRIVE OFFER

These top quality 3½" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc. They run directly from the BBC B/Master's own PSU.

- **CLS35 400K Unit** **£69**
- **CLD35 800K Unit** **£126**

Mysteries of Disc Drives & DFS Revealed

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

Then The Mysteries of Disc Drives and DFS Revealed is the book for you. It explains in detail the different types of systems available, how they are installed and how to use them. Many examples are given including pre-written programs to call various functions of the DFS available only through Operating System calls. Different types of disc, 40/80 tracks etc. are all explained. This book is ideal for the beginner confused by the plethora of choice available in the marketplace.

£5.95 (Book No VAT)

DISC ALBUMS

Attractively finished in black leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

£4

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. Available in 3½" & 5¼", please specify.

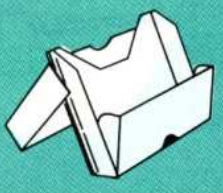
£6

ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

- **M35** - holds upto 50 5¼" discs **£6.00**
- **M85** – holds upto 95 5¼" discs **£8.00**
- **M25*** – holds upto 25 3 ½" Discs **£5.50**
- **M50** – holds 50 3½" Discs **£7.50**
- **M10** – holds upto 10 Data Cartridges **£15**

* Not lockable



PLASTIC LIBRARY CASES

Holds up to 10 5¼" Discs. **Only £2.00**

DISC PLONKER RACK

When using ones micro, there is a tendancy to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk.

Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. It holds up to eight 5¼" Discs.

Protection at Only: **£2**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates capacity in single density mode. That within the brackets is the capacity in double density mode. All disc drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch.

***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

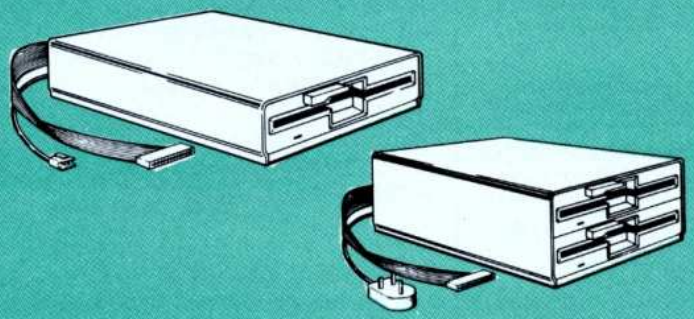
Various UK "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today)!

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 5th page of our advert for the Plinths).
P.S. All our 5¼" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.

Our Disc Drives conform to BS415



Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
200K (360K)	CLS 200 £89		CS 200 £98	
400K (720K)	CLS400S £82	CLD 400 £168	CS 400S £92	CD400 £188
800K (1.44M)		CLD 800S £162		CD 800S £182

● TWIN Disc Drive Case, complete with Power Supply & Cables **£43**
Securicor carriage on Disc Drives £5 to £6

Prefix ***C*** *= Cased Drive*
L *= Less PSU*
S *= Single*
D *= Double*

Suffix ***S*** *= 40-80 Switchable*

e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5¼" 400K, (720K in double density); Double sided; 40/80 track switchable.

Cable to connect 5¼" Disc Drives to BBC Compact
Single £9 Twin £12
Special Cable to connect both 3½" and 5¼" Disc Drives simultaneously to the BBC Compact £13

3M – DISKETTES

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electronics your 3M Appointed Distributor.

- *10 × 5¼" S/S D/D 40 Track Diskettes (744)* **£6.00**
- *10 × 5¼" D/S D/D 40 Track Diskettes (745)* **£7.50**
- *10 × 5¼" S/S D/D 80 Track Diskettes (746)* **£11.50**
- *10 × 5¼" D/S D/D 80 Track Diskettes (747)* **£11.00**
- *10 × 5¼" 1.6M D/S D/D High Density Discs for IBM XT and AT* **£19**
- *10 × 3½" S/S D/D 40/80 track Discs* **£10.00**
- *10 × 3½" D/S D/D 40/80 track Discs* **£11.75**
- *10 × 3½" High Density Diskettes* **£37**

TOP QUALITY 3½" & 5¼" DISKETTES

To complement our range of Quality Discs and Disc Drives, WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

- *10 × **M3** 3½" D/S D/D 80 Track Discs* **£11**
- *10 × **M9** 3½" Double Side High Density* **£34**
- *10 × **M4** 5¼" S/S D/D 40 Track Discs* **£5**
- *10 × **M5** 5¼" D/S D/D 40 Track Discs* **£7**
- *10 × **M7** 5¼" D/S D/D 80 Track Discs* **£9**
- **10 × M8 5¼" D/S H/D Hi-Density Discs** **£14**
- *3" Double Sided Discs* ***£3 each***

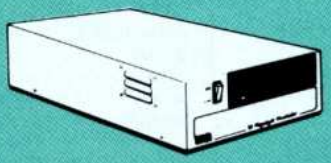
PRICES SLASHED

Special BULK OFFER on 5¼" DISCS

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	£35	£39	£45
● With Sleeves	£38	£42	£48



WATFORD's WINCHESTER DRIVES

Undoubtedly the best value for money Winchester Hard disc available anywhere for the BBC Micro.

This 30 Megabyte hard disc is completely compatible with the Acorn ADFS – that's why we have bundled it with each Winchester drive, along with a full user guide and full utilities including file copy, 1000K save routines, Format and Verify – in fact all you need and more.

Finished in rugged metal and fetching BBC beige, the Winchester has an internal fan, so quiet you won't even hear it! A switched mode power supply and a neon-lit on/off switch are there along with a light on the hard disc to tell you when it is working – just compare the price with our competitors' 20 or 28 Mbyte discs!

Compatible with the Master, and the BBc B (with 17 X disc interface).

● 10 Megabyte **£350;** ● 30 Megabyte **£420**

CDP800S **CDPM800S**

Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

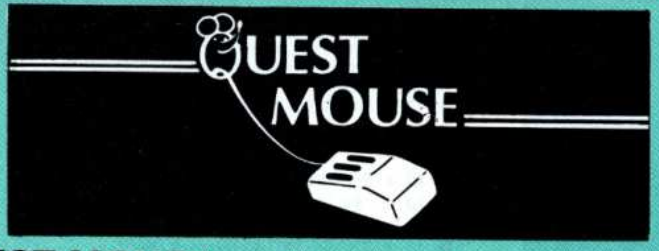
CDP 800S for BBC Micro £192
CDPM 800S for Master £196
DP35-800 for BBC/Master £165
(For DP35-800S spec. see Page 9 of our advert)

(Securicor Carr. £7)

(The above drive units are 2 Megabytes unformatted)

Continued

NOMINATED FOR BRITISH MICRO COMPUTING AWARDS 1987



QUEST MOUSE

The ultimate in Mouse technology, the Watford Electronics Quest Mouse must be the most powerful Mouse package yet produced for the BBC Micro. Featuring state of the art 32K ROM software the Quest Mouse package is filled with features essential to the budding artist. The Quest Mouse is a high precision, low profile and large footprint mouse. It has three large comfortable buttons and its RUBBER COATED STEEL BALL is smooth and easy to use on virtually any work surface. This also eliminates any directional bias that one encounters on the most well-known mouse for the BBC. The Quest Mouse is FULLY HARDWARE COMPATIBLE with the AMX MOUSE so that it will work with any of the AMX range of software.

The two parts of the Quest package are available separately so that existing Mouse owners can upgrade to the Watford's sophisticated Quest Paint software or replace their existing worn out mice for a minimum cost.

QUEST PAINT

The Quest Mouse software is supplied on a PALPROM unit to allow the sophisticated 32K program to be used from a single ROM socket. It is compatible with the BBC B, BBC B Plus and BBC Master Series machines.

The software is used to draw high resolution Mode 1 pictures in full colour. All menu selection and control of the drawing process is performed with the mouse so that you will hardly ever touch the keyboard.

SOFTWARE FEATURES

The software is far too powerful for us to describe it fully in such a small space. Below is a list of the various features. Please write to us for a fully descriptive leaflet.

Disk interface not required. Utilities disk has facility to create and print big screens. Colours applied can be solid, either pattern of user defined pattern. Drawing can use brush or airbrush. Brush shapes can be defined and stored. Airbrush sprays colour/pattern randomly with four jet sizes and even or center spread. Colour cycles. Colour protection to stop particular colours from being overwritten by selected drawing actions. All standard drawing facilities like: rubber, straight pencil lines, triangles, circles, ellipses, rectangles, parallelograms, polygons, etc are provided. All shapes can be solid or just a boundary line. Once a shape has been set up it can be repeated anywhere on the screen. Global colour replace in a rectangle. Powerful fill facility for areas and vertical/horizontal lines. Full cut and paste of rectangular areas with rotation and size with screens from Watford Beeb Video digitiser. Load and Save screens with colour pallet information, save brush and pattern definitions etc.

Take The Guesswork Out of Selecting a Mouse Package

With reviews like this how can you go wrong.

Popular Computing Weekly, 9-11 June '87
"What you actually get for your money is a well built, three button mouse (far superior to the AMX mouse)."
"Overall the combination of a quality mouse and decent art package gives Watford Electronics a real chance of supplanting AMX as mouse supremos."

Micro User June '87
"Quest Mouse and Quest Paint can hold their heads high in the market. . ."

A&B Computing June '87
". . . Watford Electronics, a company famed for excellent hardware add ons and versatile software packages. Called Quest mouse, "this is a very special mouse driven drawing package..."

". . . you will have one of the most comfortable and professionally built mice I have used in a long time. The buttons are responsive, the mouse movement is smooth and without directional bias – a pleasure to use."

"What we have here is probably the best art package there is for the BBC Micro . . ."
"Quest Paint is a major leap forward in BBC programming. . ."
"Quest Paint is an original piece of programming, it is friendly and well endowed with many useful facilities. I would comfortably say it is easier to draw good pictures with Quest Paint than it is with more expensive 'Professional' art packages for the Atari ST and the Commodore Amiga. A recommended buy if you are looking for the best in BBC micro based art packages".

Acorn User, September '87
"The mouse (Quest) performs well in the face of competition from AMX, Wigmore and the rest . . ."
". . . this package represents excellent value for money. If you are interested in art then this program is for you to buy".
"Given time, I can see no reason why Quest Paint shouldn't take on the title of the definitive art package available for the BBC Micro to date".
"All in all, Quest Paint is a very professional package. It contains virtually every feature the budding artist could require".
"What makes Quest Paint so versatile is the addition of a sub-menu which allows you extensive control over each function".
"Until recently, Superart from AMS had been judged as the definitive mode 1 graphics package for the BBC micro. But now it has a serious rival in the form of Quest Paint, from Watford".
"As a measure of what is contained within Quest Paint, I would say it had all the features of Superart plus . . ."
"In most art packages, provision is given for drawing triangles and rectangles. Quest Mouse goes 14 better, allowing any regular polygon of upto 16 sides".
"One facility, not found on any other Art package to my knowledge, is the ability to access a digitiser from within the program".
The reviewer concludes by saying, "The result is an extremely comprehensive and professional art package".

John Kilby, Head of Computer Science, Bishop Wulstan High School, Rugby, writes:
"Quest has been an excellent piece of equipment. The problem that seems to occur everyday is that at lunchtime the pupils rush to the computer room to make sure that they are first in the queue for the 'Quest' mouse".

Lt. Col. C.G. Holton, HQ 1 (BR) Corps, BFPO 39, writes:
"As ever your service is superb and the Quest Mouse proves every bit as good as the adverts claim".

Beeblet User Group, New Zealand Oct '87:
"One of its nicer features is that the top menu is done in Mode 0, the drawing itself is in Mode 1. Thus on screen together are two different Modes. A neat way around an old problem".

"PAN is used when a larger than one screen size image is required. The mind boggles at an A3 size drawing".

"I like it partly because of the mouse itself which is smooth and easy to handle but mainly I suppose because of the features I longed for and previously never got. Its easy to use with almost everything at your fingertips from the mouse. The software is simple where needed and complex where complexity is required".

ConQuest

Watford's Quest package is an extremely powerful and flexible drawing package, with very wide and unusual features. However, since its launch various suggestions for even more advanced & powerful facilities were received from the Quest users. ConQuest allows you these more advanced facilities, like, distortion of a cutout to any shape and a full font designer. If you also have a GXR ROM in your machine or you are using a BBC Master then ConQuest will take advantage of this to give ellipses at any angle, sectors and arcs, etc. Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.
Some of the features are:

- *Pick filenames off the screen for loading and saving.*
- *Rotate a cutout to any angle and Distort it to any four sided shape.*
- *Has Built in Font editor.*
- *Default brushes and patterns on startup.*
- *16 x 16 font available on start up.*
- *Ability to reset patterns, fonts and brushes to default at any time.*
- *ROM based enhanced Epson and compatible printer dump.*
- *ROM based enhanced extended picture routine.*
- *Ability to create and abort extended pictures.*
- *Improved disk access speed for extended pictures.*
- *User definable sideways RAM driver for incompatible sideways RAM systems.*
- *Ellipses at any angle on Master 128 (or B with GXR ROM).*

QUEST MOUSE & QUEST PAINT	***£49***
QUEST MOUSE, QUEST PAINT, AMX PAGEMAKER & PAGEFONT	***£82***
QUEST MOUSE ONLY	***£25***
QUEST PAINT SOFTWARE	***£32***
QUEST FONT DISC	***£12***
ConQuest 32K ROM Package	***£29***
QUEST MAT	***£3***
Part-exchange your old Mouse for a New QUEST MOUSE for only	***£23***
GXR ROM for BBC Micro	***£22***

N.B.
1. Quest Paint supplied complete with Software in a 32K ROM, Comprehensive User Guide and a Utility Disc.
2. Quest Font Disc has 22 text FONTS for use within Quest Mouse.

MARK II LIGHT PEN

Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted.

Price Only £21
(Price includes FREE software Disc and Operating Manual)

RB2 Marconi Tracker Ball

RB2 (AMX/Quest compatible)	£49
RB2 including Quest Paint	£78

FLEET STREET EDITOR

Software pack for BBC Micro	£33
Software pack for the Master	£39
Software Pack for Compact	£40
Admin Xtra Disc Utility	£13
Walt Disney Disc Utility	£13
Fonts N Graphics Disc Utility	£13

THE NEW Mk III AMX MOUSE

ONLY: £59 Inc. Super Art package
(carr £1.50)
(Please specify for BBC, Master or Compact)

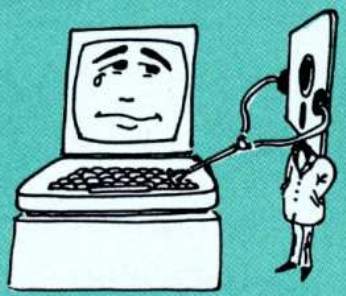
FREE our popular Colour Art software pack worth £15 with every AMX Mouse package purchased from us.

MOUSE MAT	£3
AMX MOUSE ONLY	£29
AMX UTILITY Package	£11
AMX SUPERART Package	£34
AMX STOP PRESS – A Desktop publising software. Works with Keyboard, Joystick or a mouse	£32

We are giving away absolutely FREE, our PAGE-FONT disc with every purchase of STOP PRESS from us.

PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker	£12
AMX DESIGN (ROM)	£55
AMX 3D ZICON Disc	£19
AMX XAM Educational	£15
AMX EXTRA EXTRA	£16
AMX MAX A gem of desktop (ROM)	£15

DIAGNOSTICS DISC



The BBC Micro is a very complex machine and thus diagnosing a fault can be very difficult. At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.
The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:
RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.
This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

BEEB VIDEO DIGITISER

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package i designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROMs to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£109 (Carr. £3)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)
(BBC B+ and Master compatible, except Master with Econet)

Magazine Maker

(As seen on TV)
A combination of the Pagemaker and Watford's Beeb Video Digitiser.

Using any video that provides a composite signal and the digitiser, images from a camera or TV can be converted into a graphics screen on the BBC Micro.

They can then be used within Pagemaker to illustrate magazines or newsletters – in fact anything that needs to be created on A4 size paper.

With Pagemaker's many features, a variety of pictures can be composed – the only limit being the imagination.

Pictures can be doctored using Pagemaker's graphics option to produce any number of effects.

Text can be formatted around the digitised photo on screen using the facilities available, which include 16 typefaces, character and pattern definer, text formatting and the ability to load in wordwise and viewfiles plus much more.

Once created the picture can be printed out.

The Magazine Maker is suitable for any use that requires illustrated documents.

Complete Package **£135.00** (carr. £3)

OFFICE MASTER

CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

OFFICE MATE

- DATABASE
- BEEBCALC SPREADSHEET
- BEEBPLOT GRAPHICS

DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features.

BEEBPLOT – Provides visual representation from Spreadsheet data.

OFFICE MATE Only £10 (Disc)

Disc Drives DP35-800S

A Double disc drive – with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master Series is the 5.25 inch disk, the standard for the future will most certainly be the smaller; faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.

To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system – called the DP35 800S, it contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.

The 5.25" disc drive is 40/80 track switchable. For ease of access, the switches are front mounted. DP35-800S has its own power supply, independent of the BBC Micro.

Watford's new plinth enables users to read, write and format disks both in DFS and ADFS format – currently the accepted standard for the Master Compact and the Archimedes, it also enables the user to read disks written for the Archimedes. Ideal for both BBC & Master.

Launch Offer: **£165** (carr. £7)

Continued

ARIES CORNER

B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

- Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: **£80** (carr. £2)

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries-B20 and the Aries-B32

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable "mother board" which carries the extension ROM sockets and a small "base board" on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost.

Price: Aries B-12	**£40**
Aries B-12C	**£5**

ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

£238 (Carr £3)

EXTERNAL ROM BOARD for BBC MASTER

This external Beige finished, free standing cased unit with its own Power Supply allows you to plug-in upto 12 ROMs and 16K Sideways RAM.

Only £78

SIDEWAYS ZIF SOCKET

Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£16** (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

● Complete System	**£11**
● Spare Cartridges	**£2.50**
● Spare Rack	**£1.50**

ROM Cartridges for the BBC Master
Twin **£8**; Quad **£12**

16K DISC RAM

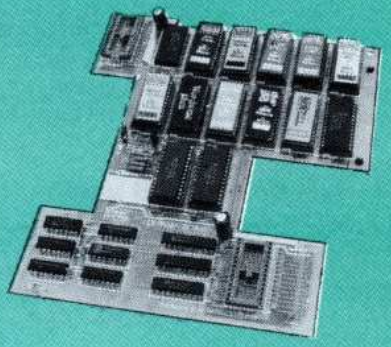
Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- Supplied complete with Battery Backup.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£35** (carr £2)

P.S. 16K Disc Ram Board is not designed to work in conjunction with a Sideways ROM Board.

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32
Battery backup fitted **£36**
Battery Backup only **£3**
(carriage £2)

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

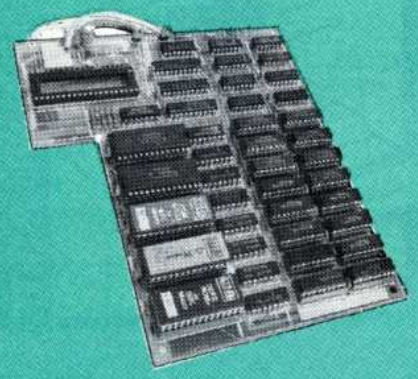
Only: £8

USER PORT SPLITTER UNIT

Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaniously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination.

Excellent Value at **£22** (carr £2)

ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

Please write in for further details.

INTRODUCTORY PRICES:

- ROM/RAM card with 32k dynamic RAM ***£48***
- ROM/RAM card with 64k dynamic RAM ***£65***
- ROM/RAM card with a massive 128k dynamic RAM **£109**

(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit **£17**
- 16k Dynamic RAM for Upgrade **£17.50**
- Battery backup **£3**
- Read and Write protect switches ..... **£2** each

Complete ROM-RAM board
All options installed **£115**

P.S.
Is your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford ROM/RAM Board and pay £5 less

Le Modem

The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- *A complete communications terminal that transforms your BBC Micro into a very powerful World-wide data transfer system.*
- *Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELE-SOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple '*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON-OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- *Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.*
- ***FREE Registration to MicroLink.***

SPECIAL OFFER

Price: ***£75***
(carr £3)

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£15 (40 or 80 track)

Acorn's Speech Synthesiser package, complete
Special Offer £18

APOLLO

The NEW Modem from Watford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost & High Performance modem with Auto Dial & Auto Answer facilities as standard) we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200-1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.
- **FREE Registration to MicroLink.**

The Apollo is attractively finished in matt black. It opens the doors to world communication to both, the Hobbyist and the Professionals alike. With baud rates varying from 300/300 Originate and Answer, 1200/75 and 75/1200 full duplex and 1200/1200 half duplex, virtually all the popular tele-services can be accessed. A comprehensive Comms ROM oversees the use of the APOLLO, providing simple commands for all the software controlled facilities. APOLLO is an ideal modem for both the first time buyer and the seasoned user. Join the Telecommunications Revolution – Buy a Watford APOLLO!

Only: **£82** **(Carr £3)**

Price includes, the Modem, Comm Software Cables & Operating Manual).
(Write in for full specification)

VOLTMACE JOYSTICKS

Delta 3B Single Joystick	**£10**
Delta 3B Twin Joysticks	**£15**
Delta 3C Joystick for Compact	**£10**
Delta 14B Single Joystick	**£11**
Delta 14B/1 Adaptor Module	**£12**
Transfer Software Disc-Tape	**£7**

ATTACHE CARRYING CASE

For the BBC Micro. Attractively finished in antique brown leatherette. Lockable.

Only **£10** (£2 carr.)

Versatile BEEB SPEECH SYNTHESISER Unit

The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

Continued ——→

COMPUTER CONCEPT'S ROMS

ACCELERATOR	£46
CARETAKER Basic Utility	£23
DISC DOCTOR	£28
Graphics ROM	£29
TERMI	£25
COMMUNICATOR	£49
SPEECH SYSTEM	£35
Printmaster	£25

Wordwise £23

Wordwise plus £40

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS DISC: £5

SPELL MASTER £42

Inter SHEET ONLY £37

INTER-CHART ONLY: £25

Inter-WORD £36

MEGA-3 ROM

Interword, Intersheet & Interchart – 3 in one ROM **£76**

INTERBASE £49

All Prices Exclusive of VAT

VIEW

VIEW WORDPROCESSOR 2.1	£35
VIEW 3.0 ROM	**£48**
VIEW PROFESSIONAL	**£59**
HI-VIEW (for 6502 2nd Processor)	**£36**
VIEWSHEET (Acornsoft)	**£36**
VIEWSTORE	**£36**
VIEWSPELL with 80 track disc	**£29**
VIEWPLOT Disc (Please specify for Master 128 or Compact)	**£20**

VISA CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

VIEW-INDEX	**£12**
OVERVIEW Packs 1 & 2	**£69**

Watford's own Sophisticated VIEW PRINTER DRIVERS

Epson FX80 & Kaga KP (Disc)	£8
Juki & Brother HR15 (Disc)	£8
Silver Reed Printers (Disc)	£8

MINI OFFICE II

DISC Version for BBC B & B+	£14.00
DISC Version for BBC Master	£16.50
ROM Version	£43.00

(When ordering please specify for which Micro & 40 or 80 track Disc).

EPSON NLQ ROM

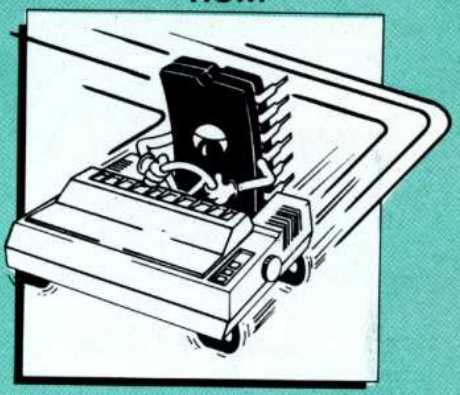
Harness the full potential of your Epson RX or FX printer. The NLQ ROM makes Epson printers produce Near Letter Quality output with optional proportional spacing, enlarged and underlined. Accessed by simple * commands from Basic, Wordwise and View (with driver) or almost any other language.

(Send an SAE for sample printout)

Only: £25

VIEW PRINTER DRIVER for NLQ ROM £7

VIEW PRINTER DRIVER ROM



View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33

ROM-SPELL

Probably the most advanced and fastest spelling checker available for the BBC Micro. Compatible with View, Wordwise and Wordwise Plus ROMSPELL is simple to use with easy editing of incorrect words. Full facilities for editing the user dictionary to allow customisation to your personal needs. Dictionary includes over 30,000 words and is supplied with a Comprehensive manual.

NOT compatible with 1770 DFS.
(Please state 40 or 80 track disc)

Price still only: £25

DUMPOUT 3

A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including full Mode 7 graphics.
Also provided are window setting utilities and OSWORD calls to plot and read Mode 7 graphics pixels.

Facilities:

- Vertical and horizontal scaling in all graphics modes and mode 7
- Rotation of image by 90, 180 or 270 degrees
- Left hand margin setting
- Screen dump window setting
- Colours appear as grey scale
- Two tone fast dump
- Colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered and User Port triggered dumps

The Micro User Feb. 1985.
'Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC Micro . . . . it must represent excellent value for money and surely cannot be beaten".

For use with the following printers:

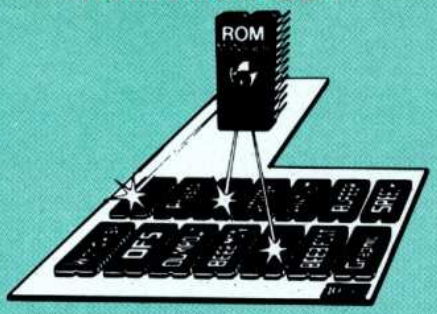
GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Panasonic KX1081/82, Mannesman Tally and compatibles.

Only: £25

BBC SOFTWARE'S Popular Educational Software

- Maths with a Story 1 (Disc). 4 primary level maths programs **£11.25**
- Maths with a Story 2 (Disc) 4 further maths programs **£11.25**
- Picture Craft (Disc) 6 - 14 age group. Pack consists of flexible geometrical design & colouring programs **£17**
- WAVES: Science Topics (Disc) CSC O Level Physics program. **£14.95**
- RELATIONSHIP: Science (Disc) O Level Biology program. **£20.00**
- BONDING: Science (Disc) O Level Chemistry program. **£20.00**
- ELECTROMAGNETIC SPECTRUM (8 Discs) O Level program. **£20.00**
- ELECTRONICS IN ACTION (Disc) O Level program **£19.95**
- NEWTON & THE SPACE SHUTTLE (Disc) O Level program. **£20**
- ECOLOGY (Disc) O Level program. **£20**
- POLYMERS (Disc) O Level program. **£20**
- Clasification & Periodic Table O Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule. **£20**
- FOOD & POPULATION (Disc) O Level program. **£20**
- MICROTECHNOLOGY (Cassette) O Level program. **£11.25**
- A VOUS LA FRANCE (2 Cassettes) A French language home study aid. **£21.70**
- DEUTSCH DIREKT! (Disc & Audio Cassette) **£19.95**
- Modem Master (Disc) **£11.25**
- ADVANCED TELETEXT SYSTEM **£8.65**
- PERIOD TABLE SOFTWARE **£20**
- Astronomy – Primary (Disc) **£12**
- Computers at Work – Primary **£17.35**
- Introducing Geography – Primary **£17**
- **Introducing Geography 11-17yrs** **£17.50**
- Electric Fields 6-14 years **£11.25**
- BlackQueen Contract Bridge **£13**
- Espana Viva – 3 Discs **£19.95**
- A Vous La France Disc **£21.50**

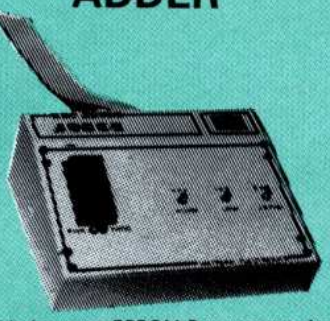
ROM MANAGER



Take control of your Sideways ROMs with ROM Manager. This powerful utility ROM gives you power over your sideways ROMs. Disable whole ROMs, send commands directly to named ROMs and many other powerful facilities.
"Provides comprehensive management of all your installed ROMs". (BEEBUG November '84.)

ONLY £20

ADDER



The only low cost EPROM Programmer for the BBC Micro that will program both the standard 21V and the new 12V5, 27128 EPROMS.
Adder is the ultimate EPROM programmer for the BBC Micro. It will program many different EPROMs up to the very latest 27256 32K devices.
The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled.
The Adder software provides sophisticated facilities for programming EPROMs from a RAM image produced by loading disc files. The software is menu driven and designed for ease of use.
Features:

- Two ultra fast programming algorithms or standard slow algorithm.
- Supports standard 21V programming and newer 12.5 volt EPROMs. (Software switched).
- The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.
- Automatic processing to handle a list of files to program into the EPROM.
- Automatic disc buffering to allow programming of 32K 27256 devices from a 32K file without extra effort.
- Verification gives detailed error list and checksums are maintained. There is also a blank check facility.
- Works with all standard filing systems. Generates header code for RFS ROMs to allow Basic programs etc. to be stored in EPROM. More than one file per ROM permitted.
- Programs the following EPROMs: From 2K to 32K: 2516, 2716, 2532, 2732, 2764, 2764A, 27128, 27128A, 27256 (Both 12.5V and 21V).

£75 (£3 Carr)

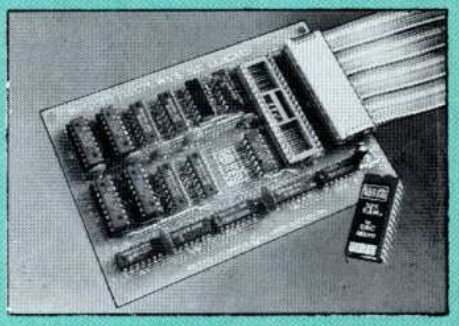
TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** – Standard version erases up to 16 chips. **£28** (carr £2)
- **ERASER GT** – Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30** (carr £2)
- Spare UV tubes. **£9**

32K

SHADOW RAM- Printer Buffer Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.
- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.
- Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.
- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.
- Recommended by Computer Concepts for use with their Inter series of ROMs.

Only £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

INCREDIBLE WORDPROCESSING DEAL

Watford's 32K SHADOW RAM CARD and Computer Concept's INTERWORD Wordprocessor package.

at Only **£89** (carr £2)

Continued ——→

BOOKS (No VAT on Books)

15 Hr Wordprocessing BBC/View	£5.95
15 Hr Wordprocessing BBC/WW & WW+	£5.95
30 Hour BASIC (BBC Micro)	£9.95
6502 Assembly Language Program	£19.95
6502 Application	£13.95
6502 Development Package	£7.50
6502 Programming the	£16.95
6502 Reference Guide	£10.95
68000 Assembly Language	£15.95
68000 Assembly Language Prog.	£19.95
68000 Assembly Language Techniques	£24.95
68000 Machine Code Programming	£13.00
68000 Microprocessor Handbook	£14.95
68000 Programming the	£22.95
68000 User Guide	£8.95
6809, Programming the	£18.95
Advanced Disc User Guide	£18.95
Advanced Prog. Guide to BBC	£9.95
Adv. Sideways RAM User Guide	£9.95
Advanced User Guide for BBC	£10.95
Amiga Hardware Ref Manual	£23.70
Amiga Machine Lang. Guide	£19.95
ARM Assembly Lang. Prog. Manua £12	
Art of Microcomputer Graphics	£16.95
Assembly Language Prog. for the BBC	£9.95
AY-3-8910 Programmable Sound Generator Data Manual	£3
BASIC 2 – User Guide	£2
Basic ROM User Guide	£11.95
BBC – Advanced Graphics with the	£10.95
BBC – Advanced Programming Techniques for	£8.95
BBC – Mastering Assembly Code	£8.95
BBC Micro & the small Business	£5.75
BBC Micro Basic Sound & Graphics	£7.95
BBC Micro – File Handling On	£7.95
BBC Micro Programs in BASIC	£5.95
BBC Micro ROM Book	£10.95
BBC Micro – within the	£13.95
BBC Master 128 for High Flyer	£10.95
BCPL User Guide	£14
BCPL The Language & its Compiler	£8.50
C Big Red Book of	£7.50
C - A Dabhand Guide to	£14.95
'C' Introducing	£9.95
C for Programmers	£9.95
C Programming Lang.	£23.95
COMAL – Introduction to	£9.50
Complete FORTH	£6.95
Computer Graphics & CAD fundamentals	£9.95
Deutsch Direkti (Book only)	£5.95
DNFS Instruction Booklet	£2
Disc Drive Projects for Micros	£6.50
DISC FILING SYSTEM (DFS) Operating Manual for BBC	£6.95
File Handling on BBC Micro	£8.50
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FORTH – Introduction to	£8.95
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FORTH – Starting	£19.10
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Introduction to LOGO	£6.95
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Inside Information, Computers & Coms.	£9.95
ISO-PASCAL Reference Manual	£9.95
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LISP Looking At	£11.95
LISP on the BBC Micro	£7.95
LISP the Language of Artificial Intelligence	£13.95
Logo on the BBC Micro	£7.50
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Mastering Assembly Code	£8.95
Mastering CP-M	£17.95
Mastering Interpreters & Compilers	£14.95
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Mastering the Disc Drive	£7.95
Master Operating System	£12.95
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PASCAL Programming	£9.45
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Practical Disc File Techniques	£5.95
Structured Basic	£7.95
The Epson FX-KAGA PRINTER Commands REVEALED	**£5.95**
The Software Business	£5.50
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Using DOS+ on the 1512 (95% Ok for 512 Bd)	£9.95
View 3.0 User Guide	£10
View Guide (View 2.1)	£4.50
Viewsheet & Viewstore Dabhand Guide	£12.95
Mastering View, Viewsheet & Viewstore	£12.95
VIEW Dabhand Guide	£12.95
Viewsheet User Guide	£10
Viewstore User Guide	£10
Wordprocessing On The BBC Micro	£6.25
Writing Interactive Interpreters & Compilers	£8.45
Wordwise + A User Guide	£10.95
Z80 Applications	£15.95
Z80 Assembly Language Prog.	£20.95
Z80 Programming the	£19.95
Z80 Reference Guide	£9.95
Z88 Computing	£9.95

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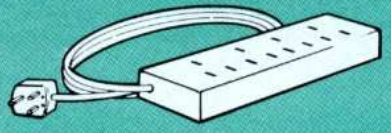

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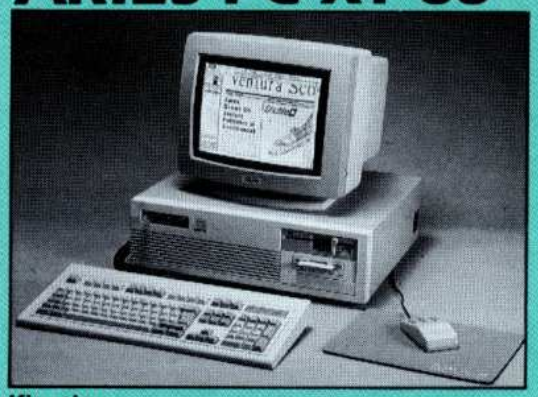

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Rick Hughes

Archimedes DISARMING

Smart disassembler for Archimedes

Although Archimedes is equipped with an extremely powerful BASIC, many commercial programs are written in ARM assembler for reasons of speed and efficiency (no doubt security is a consideration, too). In fact Archimedes is an accommodating machine for the assembler programmer as it includes the BASIC in-line assembler, as on the BBC series computers and a machine-code monitor in the form of the *DEBUG command. So, the use of assembly language on Archimedes is no surprise and even if you don't write assembler, you will have seen it many times – for example in the program described here, and you will find that having a user-friendly disassembler will whet your appetite for machine-language.

For those who don't know, a disassembler is a program that unscrambles machine-code back into (more or less) readable instructions – exactly the opposite task of the in-line BASIC assembler mentioned earlier. This is useful for reading your own assembler programs to see why they don't work, and even more useful for reading everyone else's to see how they do.

Probably one of the first things you will use it for is to disassemble some of the Modules in your computer to see some of Acorn's expertly written code. Actually, this is already possible: *modules will tell you where all the in-built routines are located and then *debug , followed by memory <address> will disassemble code from that address and enable you to study it.

Other facilities in *debug will allow you to run the code under controlled conditions by setting registers, breakpoints and so forth.

However, we are not here to use *debug – for many purposes, its disassembler is inconvenient to use and we need something more powerful. Such a disassembler is the subject of this article.

Program Features

The disassembler has two modes of operation:

i) Starting from a selected address, code is disassembled and printed until either a chosen end address is reached or a chosen number of instructions have been output. The destination for the listing might be a printer (if activated with CTRL-B before typing the *dis command), or a file (by issuing a *spool command) or you can just watch it flash past on the screen – don't attempt to read it, though!

ii) By using the cursor keys, you can scroll backwards and forwards through a piece of code, in the manner of the resident BASIC editor, and unless you require a printed copy, you will probably want to use this option. In this mode the following keys are active:

Cursor Up Scrolls the text back by one instruction (four bytes).

Cursor Down Scrolls the text forward one instruction.

Page Up Goes back by a whole screen (100 bytes).

Page Down Goes forward by one screen.

Cursor Right If the 'Operand' field contains a meaningful address (highlighted in yellow) then pressing this key will 'follow' that address, after saving the current one on the internal stack. The 'Stack' field shows the address on the top of the stack, together with the stack depth.

Cursor Left If there is a return address on the internal stack, displayed at the top of the screen, this key will return to that address and display the next item below it on the stack.

Use of the cursor left and right keys will allow you to follow any piece of code without having to constantly write down the addresses of branch instructions or calculate the references for ADRs. If you have experience of assembler, you will know that branches and subroutine calls make up a fair percentage of all but the very simplest programs. Thus these two keys provide a most valuable facility for program analysis.

Delete If the thread of the program becomes too convoluted, or you wish to study a new piece of code without unstacking all the addresses you have stacked up, then this key will clear the stack (and leave you where you are).

Home To move to an entirely new area of code, pressing the 'Home' key will allow you to type in an address, which will then determine the next instruction to be disassembled. The stack is preserved.

Escape Leaves the disassembler and returns you to the calling routine.

Display

Colour is used to make the screen display easier to understand and to highlight certain addresses that can be 'stacked'. Personally, I don't like to see over-zealous use of colour – just because lots are available does not necessarily mean we need to use them all – but subtle use of a few colours can break up an otherwise monotonous display and make it more pleasant to look at without being garish. After all, a screenful of assembler is hard enough to follow without giving us eye-strain! Note that when you are in this mode, the 'current' address is not the one at the top of the screen, but lies about half-way down (this is easily changed by amending the program variable *distancedown*). Again this is a personal preference as I like to see all around the code I am studying, not just ahead of it. The line you are looking at is highlighted with '>>' and '<<' markers which

should make it fairly clear. Whether you are printing or using the 'screen' version, the output is the same and consists of lines of disassembled instructions looking something like this:

0000B7D4 B&.. EB002642 BL &00150E4
0000B7D8 .... E3A00001 MOV R0,#1
0000B7DC 8... E51F1338 LDR R1,&000 B4AC

Reading from the left, the various fields are:

address This is always a multiple of four as ARM instructions are always aligned to double-word boundaries.

ASCII A character representation of the four bytes at address. Non-ASCII characters are replaced by ".".

hex The same four bytes, this time in hex and backwards . This is because the instruction loads into a register this way and bit 31 (the most significant) needs to be on the left.

op-code The ARM assembler instruction and...

operands ..the rest of the instruction.

How to use it

The disassembler is implemented as a utility, that is, a program that resides on disc until it is summoned with a star command. From then on, it behaves like other 'star' commands until it is finished, when it 'disappears' from the computer. This is a very convenient way of implementing transient routines and it is worthwhile building a collection of such routines either in a 'Library' directory or even on a disc by themselves.

The program listing generates a utility called '*Dis' which is loaded from the current library whenever you call its name. To generate the utility, type in the program (and save it before you do anything else). Now, following RUN a file called 'Dis' is saved to your disc – you are now ready to start disassembling! The program you have just typed in is (theoretically) no longer needed, but you should save it in case you want to make some alterations or improvements. I keep programs like this one in a 'SOURCE' directory.

We have already seen that there are two distinct versions of our 'dis' command; for option (i) the command is:

***dis <address> +<length>/<last address>**

or for option (ii):

***dis <address>**

Here, 'address' is the address of the first instruction that will be disasssembled, 'length' is the number of bytes to disassemble and 'last–address' is, as the name suggests, the address of the last instruction to be disassembled.

All items are entered as hex values, without preceding &s. It is not necessary to specify which option you want – the program can work that out for itself, by looking at the parameters; if there are two, you want to list, if there is only one, then you want the scrolling version.

To make this clear, suppose you want to print out a disassembly of 500 (hex 1F4) bytes of code starting at BC00, then press CTRL-B to activate your printer followed by:

***dis BC00 +1F4**

or:

***dis BC00 BDF4**

Don't forget <CTRL-C> when the print has finished!

On the other hand if you want to look more closely at the code in this area:

***dis BC00**

will allow you to scroll through it to your heart's content using the keys described above. Probably one of the first things you will want to do is to have a look at the internal modules. To do this, type *modules and note the address of say, the ARMBASIC-Editor. Now:

***dis <this address>**

will initially reveal some meaningless instructions – this is the module header, followed by the title (check the ASCII column) and then the code that makes up the module. This should keep you busy for a while!

How It Works

At the heart of this program is a subroutine; DoALine which is called with an address as its parameter, and which then produces a whole line of disassembled text based on that address. The rest of the program simply amends the address parameter in various ways, depending on which keys you press. This is actually absurdly easy (for two reasons which will be explained shortly), but our smart disassembler has to earn its name and it must have other tricks up its sleeve, too.

Certainly it is possible to write a very short disassembler if scrolling is all you want to do. The first option described earlier repeatedly calls this routine, incrementing the address by four before each call and when the address exceeds the calculated maximum limit, the listing is finished. When you take the second option, scrolling around the code is just as easy, since all ARM instructions are four bytes long, which means that going back say, 25 instructions is no more difficult than counting forwards.

Now, how to disassemble instructions? The RISC chip has been very logically designed and by looking at bits within the instruction, we can quickly determine what that instruction is. However, *Acorn* have thoughtfully left a 'hook' in their debugger so that we can share their decoding routine with them. This comes in the form of the instruction: SWI "Debugger–Disassemble" which actually generates all the fields from 'op-code' onwards! This means that the really hard stuff is automatically taken care of, and we only need to print out easy things like addresses and ASCII characters.

Unfortunately, there's a catch. ARM code is position-independent and all addressing is relative, that is based on displacements from the program counter. So for example

B Freda B Freda .Freda

will generate two different (-looking) instructions when disassembled, although the branches are to the same place. Now the SWI call mentioned earlier takes as its parameter the instruction you want to disassemble, not its address, and it bases all relative address calculations on its own position (in ROM). The overall effect is that branch instructions are assigned 'wrong' destina tions. Our disassembler attends to this by spotting the branch instruction and recalculating the address.

While we are at it, there are one or two more wrongs that we can correct: If you want to address an area of your program, you might use the 'ADR' pseudo-code. This is not an ARM instruction, but an indication to the assembler to generate an ADD or SUB based on the program- counter. So

ADR r1,table . . . .table

will cause *ADD r1,r15,#...*

This is extremely difficult to understand in the context of a disassembler and so we trap ADDs and SUBs using the program counter and display them as 'ADR' with the calculated hex address as the operand. One further difficulty is caused by the complementary instructions LDR and STR. In this example we wish to load register three with the value &ABCDEF:

LDR r3,value . . . .value DCD &ABCDEF

which the assembler sees as:

LDR r3,[pc,#..]

where the calculated immediate constant is the distance from the instruction to value. Again, this is nightmarish to follow during disassembly and we detect such pc-based operations and replace the implicit address with an explicit hex address.

The only other major routine in the utility is TestException, which is responsible for rooting out instructions which need to be corrected. It is used by DoALine to overwrite some of the Debugger–Disassemble output and also by the 'Cursor-Right' routine to see if there is a genuine address to follow.

Because Dis is a utility, the system provides it with 1k of workspace when it is first entered. Register 12 (called stackbs) holds the address of this area and we build our 'Stack' here. This is not a real stack (mainly because we don't want to unstack too far by excessive use of cursor-left) but it still requires a stack pointer to keep it under control – this is stackpt.

Conclusion

Depending on your requirements, you may wish to make changes or add improvements to the routine; perhaps even turn it into a full interactive debugger. One thing that I have omitted completely is error-trapping, other than parameter vetting. A fatal error is rather more likely to arise than you might think: the Archimedes memory map is full of holes, ie addresses where there is no memory – either ROM or RAM. if you attempt to access memory in these areas, the RISC chip will stop you and generate an 'Address exception' or 'Abort on data transfer' error. Do not be alarmed – you have strayed off the path, so all you have to do is get back on again; you will have to call *dis again to do so, though. This is most likely to occur if you key in a bad address after a 'Home' keypress, although it can happen if you scroll too far past the 'Modules' area, or off the end of RAM.

This little routine (about 1.2K) will be found useful by both the experienced assembler programmer and the novice who wants to find out what assembly language is all about and it makes an excellent addition to the existing *debug command.

```
   10REM >DisSource
   20REM R.Hughes. (C) A&B 198
8
   30
   40DIM Code 2000
   50*KEY 1 EDIT|M
   60*KEY 5 PROCutility|M
   70
   80wi=&100
   90window_start=4
  100window_depth=25
  110distancedown=12
  120red=1:green=2:yellow=3:cy
an=6:white=7
  130
  140REM Register usage
  150 address= 8
  160 tempadr= 9
  170 flags  =10
  180 lastadr=11
  190 stackpt=11
  200 stackbs=12
  210
  220REM Bit settings
  230 branch_bit=1
  240 addpc_bit =2
  250 ldrpc_bit =4
  260 colour_bit=8
  270
  280FOR pass%=0 TO 2 STEP 2
  290P%=Code
  300[OPT pass%:
  310 ALIGN
  320
  330.Dis
  340 stmfd  r13!,{r14}
     ;r12 (stackbs) points to
workspace
  350 mov    r0,#16
     ;ready for base 16
  360 orr    r0,r0,#1<<31
  370 swi    "XOS_ReadUnsigned
"    ;read first address..
  380 bvs    SyntaxError
  390 bic    address,r2,#3
     ;..correct it
  400
  410.Stripper
  420 ldrb   r4,[r1],#1
     ;search for more params
  430 cmp    r4,#ASC" "
  440 blt    Scroller
  450 beq    Stripper
  460 cmp    r4,#ASC"+"
     ;'+length' option?
  470 subne  r1,r1,#1
  480 swi    "XOS_ReadUnsigned
"    ;get second address
  490 bvs    SyntaxError
  500 cmp    r4,#ASC"+"
  510 movne  lastadr,r2
  520 addeq  lastadr,address,r
2
  530
  540.DeSpace
  550 ldrb   r4,[r1],#1
     ;any more?
  560 cmp    r4,#ASC" "
  570 beq    DeSpace
  580 bgt    SyntaxError
     ;yes - wally!
  590
  600;***** Option (1) - print
 to screen *****
  610 mov    tempadr,address
  620 bic    flags,flags,#colo
ur_bit
  630
  640.Printer
  650 bl     DoALine
  660 swi    "OS_NewLine"
  670 swi    "OS_ReadEscapeSta
te"
  680 bcs    Escapade
  690 add    tempadr,tempadr,#
4
  700 cmp    tempadr,lastadr
  710 ble    Printer
  720 ldmfd  r13!,{pc}
  730:
  740.Escapade
  750 mov    r0,#126
  760 swi    "OS_Byte"
  770 ldmfd  r13!,{pc}
  780:
  790;***** Option (2) - use s
crolling window *****
  800.Scroller
  810 mov    r0,#4
  820 mov    r1,#1
  830 swi    "OS_Byte"
     ;cursor keys off
  840 swi    wi+22
     ;Mode 12
  850 swi    wi+12
  860 swi    "OS_RemoveCursors
"
  870 swi    "OS_WriteS"
  880 dcb 17:dcb cyan
  890 dcb 31:dcb 2:dcb window_
start-2
  900 equs "Address   ASCII
 Hex      Op-Code"
  910 equs " Operands
  Stack:"
  920 dcb 31:dcb 1:dcb window_
start+distancedown
  930 dcb  8:equs  >>"
  940 dcb 31:dcb 78:dcb window
_start+distancedown
  950 equs "<<"
  960 dcb  0
  970 mov    stackpt,#0
  980 orr    flags,flags,#colo
ur_bit
  990
 1000.FillScreen
 1010 swi    "OS_WriteS"
     ;Set window
 1020 dcb 28
 1030 dcb  2:dcb window_start+
window_depth-1
 1040 dcb 77:dcb window_start
 1050 dcb 12
 1060 dcb  0
 1070 mov    r6,#window_depth-
1
 1080 sub    tempadr,address,#
distancedown*4
 1090
 1100.Looper
 1110 bl     DoALine
 1120 swi    "OS_NewLine"
 1130 add    tempadr,tempadr,#
4
 1140 subs   r6,r6,#1
 1150 bne    Looper
 1160
 1170.PreGetLoop
 1180 bl     DoALine
 1190
 1200.GetLoop
 1210 mov    r0,#129
     ;Look for Page UP
 1220 mov    r1,#256-64
 1230 mov    r2,#255
 1240 swi    "OS_Byte"
 1250 tst    r1,#&FF
 1260 subne  address,address,#
(window_depth*4)
 1270 bne    FillScreen
 1280
 1290 mov    r1,#256-79
     ;Look for Page DOWN
 1300 mov    r2,#255
 1310 swi    "OS_Byte"
 1320 tst    r1,#&FF
 1330 addne  address,address,#
(window_depth*4)
 1340 bne    FillScreen
 1350
 1360 swi    "OS_ReadC"
     ;Check keyboard
 1370 bcs    Escaped
 1380 cmp    r0,#30
     ;Home?
 1390 bne    NotHome
 1400 swi    "OS_WriteS"
 1410 dcb 26
 1420 dcb 31:dcb 1:dcb 30
 1430 equs "-"
 1440 dcb  0
 1450 swi    "OS_RestoreCursor
s"
 1460 adr    r0,buffer
 1470 mov    r1,#7
 1480 mov    r2,#0
 1490 mov    r3,#255
 1500 swi    "OS_ReadLine"
 1510 bcs    Houdini
 1520 mov    r0,#16
 1530 orr    r0,r0,#1<<31
 1540 adr    r1,buffer
 1550 swi    "XOS_ReadUnsigned
"
 1560 bicvc  address,r2,#3
 1570 swivs  wi+7
 1580
 1590.Houdini
 1600 mov    r0,#126
 1610 swi    "OS_Byte"
 1620 swi    "OS_RemoveCursors
"
 1630 swi    "OS_WriteS"
 1640 dcb 31:dcb 1:dcb 30
 1650 equs "          "
 1660 dcb  0
 1670 bvc    FillScreen
 1680 b      GetLoop
 1690:
 1700.NotHome
 1710 cmp    r0,#127
     ;Delete?
 1720 moveq  stackpt,#0
 1730 beq    Stacker
 1740
 1750 cmp    r0,#136
     ;Left?
 1760 bne    NotLeft
 1770 cmp    stackpt,#0
 1780 beq    GetLoop
 1790 sub    stackpt,stackpt,#
4
 1800 ldr    address,[stackbs,
stackpt]
 1810 b      Stacker
 1820:
 1830.NotLeft
 1840 cmp    r0,#137
     ;Right?
 1850 bne    NotRight
 1860 mov    tempadr,address
 1870 bl     TestException
     ;check instruction
 1880 tst    flags,#branch_bit
+addpc_bit+ldrpc_bit
 1890 beq    GetLoop
 1900 str    address,[stackbs,
stackpt]
 1910 mov    address,r3
 1920 add    stackpt,stackpt,#
4
 1930
 1940.Stacker
 1950 swi    "OS_WriteS"
 1960 dcb 26
 1970 dcb 31:dcb 63:dcb window
_start-2
 1980 dcb  0
 1990 cmp    stackpt,#0
 2000 bne    GoodStack
 2010 swi    "OS_WriteS"
 2020 equs "          "
 2030 dcb  0
 2040 b      FillScreen
 2050:
 2060.GoodStack
 2070 swi    wi+17
 2080 swi    wi+yellow
 2090 add    r1,stackbs,stackp
t
```

```
 2100 ldr    r0,[r1,#-4]
 2110 adr    r1,buffer
 2120 mov    r2,#9
 2130 swi    "OS_ConvertHex8"
 2140 add    r0,r0,#1
 2150 swi    "OS_Write0"
 2160 swi    wi+9
 2170 mov    r0,stackpt,lsr #2
 2180 adr    r1,buffer
 2190 mov    r2,#3
 2200 swi    "OS_ConvertHex2"
 2210 swi    "OS_Write0"
 2220 b      FillScreen
 2230:
 2240.NotRight
 2250 cmp    r0,#138
     ;Down?
 2260 bne    NotDown
 2270 swi    "OS_WriteS"
 2280 dcb 31:dcb 1:dcb window_
depth-1
 2290 dcb 13:dcb 10
 2300 dcb  0
 2310 add    tempadr,address,#
(window_depth-distancedown)*4
 2320 add    address,address,#
4
 2330 b      PreGetLoop
 2340:
 2350.NotDown
 2360 cmp    r0,#139
     ;Up?
 2370 bne    GetLoop
 2380 swi    wi+30
 2390 swi    wi+11
 2400 sub    address,address,#
4
 2410 sub    tempadr,address,#
(distancedown*4)
 2420 b      PreGetLoop
 2430:
 2440;***** Disassemble the co
de at [tempadr] *****
 2450.DoALine
 2460 stmfd  r13!,{r14}
 2470
 2480 tst    flags,#colour_bit
 2490 swine  wi+17
 2500 swine  wi+red
 2510 mov    r0,tempadr
     ;put the address
 2520 adr    r1,buffer
 2530 mov    r2,#9
 2540 swi    "OS_ConvertHex8"
 2550 add    r0,r0,#1
 2560 swi    "OS_Write0"
 2570 swi    wi+9
 2580 swi    wi+9
 2590 swi    wi+9
 2600
 2610 tst    flags,#colour_bit
 2620 swine  wi+17
 2630 swine  wi+green
 2640 ldr    r1,[tempadr]
     ;put the ASCII
 2650 mov    r2,#4
 2660
 2670.Ascloop
 2680 and    r0,r1,#&FF
 2690 mov    r1,r1,lsr #8
 2700 cmp    r0,#ASC" "
 2710 movlt  r0,#ASC"."
 2720 cmp    r0,#126
 2730 movgt  r0,#ASC"."
 2740 swi    "OS_WriteC"
 2750 subs   r2,r2,#1
 2760 bne    Ascloop
 2770 swi    wi+9
 2780 swi    wi+9
 2790 swi    wi+9
 2800
 2810 ldr    r0,[tempadr]
     ;put the hex
 2820 adr    r1,buffer
 2830 mov    r2,#9
 2840 swi    "OS_ConvertHex8"
 2850 swi    "OS_Write0"
 2860 swi    wi+9
 2870 swi    wi+9
 2880 swi    wi+9
 2890
 2900 tst    flags,#colour_bit
 2910 swine  wi+17
 2920 swine  wi+cyan
 2930 bl     TestException
     ;put the clever stuff
 2940 swi    "Debugger_Disasse
mble"
 2950;It may be necessary to c
orrect the instruction....
 2960 tst    flags,#branch_bit
 2970 beq    NotBr
 2980 mov    r4,#0
 2990 strb   r4,[r1,#8]
 3000 b      PutSomeStuff
 3010:
 3020.NotBr
 3030 tst    flags,#ldrpc_bit
 3040 bne    LookForCommas
 3050 tst    flags,#addpc_bit
 3060 mov    r0,r1
 3070 beq    NoCorrection
 3080 ldrb   r4,[r1,#3]
 3090 ldr    r5,ADRWord
 3100 str    r5,[r1]
 3110 strb   r4,[r1,#3]
 3120
 3130.LookForCommas
 3140 add    r0,r1,#8
 3150
 3160.CommaLoop
 3170 ldrb   r5,[r0],#1
 3180 eors   r5,r5,#ASC","
 3190 bne    CommaLoop
 3200 strb   r5,[r0]
 3210
 3220.PutSomeStuff
 3230 mov    r0,r1
 3240 swi    "OS_Write0"
 3250 tst    flags,#colour_bit
 3260 swine  wi+17
 3270 swine  wi+yellow
 3280 swi    wi+ASC"&"
 3290 mov    r0,r3
     ;get absolute address
 3300 adr    r1,buffer
 3310 mov    r2,#9
 3320 swi    "OS_ConvertHex8"
 3330 add    r0,r0,#1
 3340
 3350.NoCorrection
 3360 swi    "OS_Write0"
 3370 ldmfd  r13!,{pc}
 3380:
 3390;***** Is instruction at
[tempadr] an exception?
 3400;***** On return (if) fla
gs set, r3 contains absolute a
ddress
 3410
 3420.TestException
 3430 bic    flags,flags,#bran
ch_bit+addpc_bit+ldrpc_bit
 3440 ldr    r0,[tempadr]
 3450 and    r4,r0,#&0E000000
     ;is it a branch?
 3460 cmp    r4,#&0A000000
 3470 bne    NotBranch
 3480 orr    flags,flags,#bran
ch_bit
 3490 mov    r4,r0,lsl #8
 3500 add    r3,tempadr,r4,asr
#6  ;adjust branch
 3510 b      PutEfAd
 3520:
 3530.NotBranch
 3540 and    r4,r0,#&000F0000
     ;does it use the pc?
 3550 cmp    r4,#&000F0000
 3560 movne  pc,r14
     ;no - get out
 3570
 3580 and    r4,r0,#&0F000000
     ;look for ldr/str x,[pc,#
y]
 3590 cmp    r4,#&05000000
 3600 bne    NotLdrStr
 3610 orr    flags,flags,#ldrp
c_bit
 3620 mov    r2,#&1000
 3630 sub    r2,r2,#1
     ;=&FFF
 3640 and    r2,r2,r0
     ;=displacement
 3650 tst    r0,#&00800000
 3660 addne  r3,tempadr,r2
 3670 subeq  r3,tempadr,r2
 3680 b      PutEfAd
 3690:
 3700.NotLdrStr
 3710 and    r4,r0,#&0FE00000
     ;is it add/sub {pc}?
 3720 cmp    r4,#&02800000
 3730 cmpne  r4,#&02400000
 3740 movne  pc,r14
 3750
 3760 orr    flags,flags,#addp
c_bit
 3770 mov    r3,r0,lsr #7
     ;get immediate rotate*2
 3780 and    r3,r3,#&1E
 3790 and    r2,r0,#&FF
     ;immediate
 3800 mov    r2,r2,ror r3
 3810 tst    r4,#&00400000
 3820 addeq  r3,tempadr,r2
 3830 subne  r3,tempadr,r2
 3840
 3850.PutEfAd
 3860 add    r3,r3,#8
 3870 bic    r3,r3,#&C0000000
 3880 mov    pc,r14
 3890:
 3900:
 3910;***** Ways out of the ro
utine *****
 3920:
 3930.Escaped
 3940 mov    r0,#126
     ;Acknowledge ESCAPE
 3950 swi    "OS_Byte"
 3960 mov    r0,#4
 3970 mov    r1,#0
 3980 swi    "OS_Byte"
 3990 swi    "OS_WriteS"
 4000 dcb 26
 4010 dcb 20
 4020 dcb 31:dcb 1:dcb 31
 4030 dcb  8
 4040 dcb 17:dcb white
 4050 dcb  0
 4060 swi    "OS_RestoreCursor
s"
 4070 ldmfd  r13!,{pc}
 4080:
 4090.SyntaxError
 4100 adr    r0,syntax
 4110 teqp   pc,#1<<28
 4120 ldmfd  r13!,{pc}
 4130:
 4140.ADRWord equs "ADR "
 4150.buffer  equs "0123456789
AB"
 4160.syntax  dcd 0:equs "Synt
ax: *Dis <address> [+<length>/
<last>]":dcb 0
 4170:
 4180.End
 4190:]
 4200NEXT
 4210
 4220PRINT " f1 to edit"
 4230PRINT " f5 to save as uti
lity"
 4240END
 4250
 4260DEFPROCutility
 4270OSCLI("SAVE Dis "+STR$~Co
de+" "+STR$~(End))
 4280*SETTYPE Dis FFC
 4290ENDPROC
>
```

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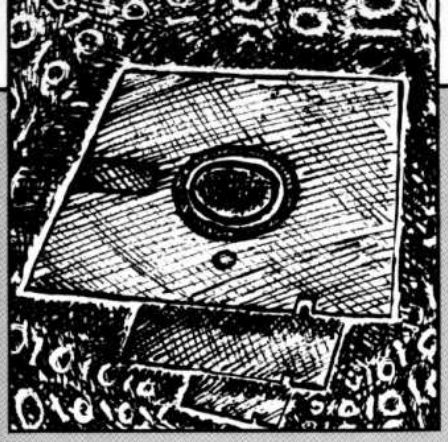

J Rawlinson

PARTLOAD

Another useful utility — enabling Beeb owners to partially load files

If you write programs in neat modular blocks, one of the benefits you will appreciate, is that bits of one program can be used in others; saving time and effort re-writing.

However, a frequent problem, is that you are left with a program in memory that require a group of lines from another program inserting at a specific point in it.

The *official* way around this, is to **SAVE** your program, **LOAD** the other program, delete the bits you don't want, then ***SPOOL** it to disc, LOAD back in the first program and *EXEC the spool file.

This all takes quite a lot of time, and, of course, only works if you have got the line numbers right; any lines with the same numbers as those in the spool file will be replaced.

So if you also want to keep your programs looking neat, you must also re-number the program.

Partsave and **Merge** commands have been written which remove the need for spooling and execing. However, they do nothing about the need to get the line numbers correct. In the accompanying listing, I present my solution to the problem. This is the new OS command ***PLOAD** with the syntax:

*PLOAD <line no 1> <file name> <<line no 2>> <<line no 3>>

This will take lines from <line no 2> to <line no 3> from the file <file name> and insert them into the program in memory at the point <line no 1>. The final two parameters are optional and will default to the first and last lines in the file.

Running the program in the listing will save the necessary machine code program in the file PLOAD, this can then be called up by typing ***PLOAD** with the necessary parameters.

The code is assembled to load just under HIMEM; this means that you should produce your PLOAD file in the screen Mode that you usually use for editing programs. The program could be very easily converted to run elsewhere in memory or from sideways RAM/ROM. PLOAD gives error messages if you get the syntax of the paramters wrong, give an incorrect file name or run out of memory.

After using PLOAD, you can end up with a program in which all the lines are not in order. This is no great problem, and can be quickly fixed with a renumber command. Notice that this renumber is much much simpler than the renumbering that a merge command will require you to do.

```
   10REM ======================
=======
   20REM PARTLOAD
   30REM J. Rawlinson
   40REM (C) A&B 1988
   50REM ======================
=======
   60
   70 PROCSETUP
   80 B%=HIMEM-1000:HIMEM=B%
   90 FOR I%=0 TO 2 STEP 2
  100 P%=B%:PROCASM:NEXT
  110 OSCLI("SAVE PLOAD "+STR$
~B%+" + "+STR$~1000+" "+STR$~p
artload)
  120 END
  130 DEFPROCSETUP
  140 BY=&FFF4:FI=&FFCE
  150 BG=&FFD7:AR=&FFDA
  160 R1L=&70:R1H=&71:R2L=&72:
R2H=&73
  170 R3L=&74:R3H=&75:SL=&76:S
H=&77
  180 RL=&78:RH=&79:XL=&7A:XH=
&7B
  190 ZL=&7C:ZH=&7D:AC=&7E
  200 L1L=&80:L1H=&81:L2L=&82:
L2H=&83
  210 L3L=&84:L3H=&85
  220 ppara=&C00:zbuf=&A00:FH1
=&86
  230 ENDPROC
  240 DEFPROCASM
  250 [ OPT I%
  260.range1
  270 LDA zbuf+2:SEC:SBC L1L
  280 LDA zbuf+1:SBC L1H:RTS
  290.range2
  300 LDA L2L:SEC:SBC zbuf+2
  310 LDA L2H:SBC zbuf+1:RTS
  320.open
  330 LDA#0:STA FH1
  340 JSR opens:STX FH1:RTS
  350.opens
  360 LDX ppara:LDY ppara+1
  370 LDA#&40:JSR FI:TAX
  380 BNE open1
  390 JSR eract
  400 EQUB 214:EQUS"Not found"
:EQUB0
  410.open1
  420 RTS
  430.close
  440 LDY FH1:BEQ closex
  450.close0
  460 LDA#0:JSR FI
  470.closex
  480 SEC:RTS
  490.rdline
  500 LDA#4:LDX#0:JSR readn:BC
S redx
  510 LDA zbuf+1:SEC:BMI redx
  520 LDA zbuf+3:SEC:SBC#4:JSR
 readn
  530.redx
  540 RTS
  550.readn
  560 LDY FH1:STA RL
  570.read1
  580 JSR BG:BCS readx
  590 STA zbuf,X:INX
  600 DEC RL:BNE read1
  610.readx
  620 RTS
  630.plsyn
  640 JSR eract
  650 EQUB220:EQUS"Syntax: PLO
AD"
  660 EQUS" <line no>"
  670 EQUS" <filename> <<line
no>>"
  680 EQUS" <<line no>>":EQUB0
  690.partload
  700 LDX#SL:LDY#0:LDA#1:JSR A
R
  710 JSR pars3:BCS plsyn
  720 JSR open
  730 LDA L3L:STA R3L:LDA L3H:
STA R3H
  740 JSR address
  750.plrlp
  760 LDA R1L:STA L3L:LDA R1H:
STA L3H
  770.plrlp2
  780 JSR rdline:BCS perc
  790 JSR range1:BCC plrlp2
  800 JSR range2:BCC perc
  810 JSR isesc:BCS perc
  820 LDA L3L:STA R1L:LDA L3H:
STA R1H
  830 JSR insert
  840 LDA L3L:STA R1L:LDA L3H:
STA R1H
  850 JSR next:JMP plrlp
  860.perc
  870 JSR close:JSR esc
  880 SEC:RTS
  890.ppclr
  900 LDX#17:LDA#&FF
  910.ppcl1
  920 STA ppara,X:DEX:BPL ppcl
1
  930 RTS
  940.pars3
  950 JSR dtbp:BCS parsf
  960 LDA R1L:STA L3L:LDA R1H:
```

```
STA L3H
  970.pars2
  980 JSR ppclr
  990 LDA#0:STA L1L:STA L1H
 1000 LDA#127:STA L2H:LDA#255:
STA L2L
 1010 JSR gkst:BEQ parsf
 1020 TYA:CLC:ADC SL:STA ppara
+0
 1030 LDA#0:ADC SH:STA ppara+1
 1040.par1
 1050 LDA(SL),Y
 1060 CMP#ASC",":BEQ par2
 1070 CMP#ASC" ":BEQ par2
 1080 CMP#13:BEQ par3
 1090 INY:BNE par1
 1100.par2
 1110 LDA#13:STA(SL),Y:INY
 1120.par3
 1130 JSR dtbp:BCS parso
 1140 LDA R1L:STA L1L:LDA R1H:
STA L1H
 1150 JSR dtbp:BCS parso
 1160 LDA R1L:STA L2L:LDA R1H:
STA L2H
 1170 LDA L2L:SEC:SBC L1L
 1180 LDA L2H:SBC L1H:BCC pars
f
 1190.parso
 1200 LDA L2H:ORA L1H:BMI pars
f
 1210 CLC:RTS
 1220.parsf
 1230 SEC:RTS
 1240.page
 1250 LDA#0:STA R1L:LDA&18:STA
 R1H:RTS
 1260.top
 1270 LDA&12:STA R3L:LDA&13:ST
A R3H:RTS
 1280.address
 1290 JSR page
 1300.addl
 1310 LDY#2:LDA(R1L),Y:SEC:SBC
 R3L
 1320 STA AC
 1330 DEY:LDA(R1L),Y:SBC R3H:B
CS addx
 1340 JSR next:BCS addl
 1350.addx
 1360 ORA AC
 1370 RTS
 1380.next
 1390 LDY#1:LDA(R1L),Y:BMI nex
l
 1400 LDY#3:LDA(R1L),Y
 1410 CLC:ADC R1L:STA R1L:BCC
nexl
 1420 INC R1H
 1430.nexl
 1440 SEC
 1450 RTS
 1460.mvdn
 1470 LDA R1H:CLC:ADC R3H:STA
R1H
 1480 LDA R2H:CLC:ADC R3H:STA
R2H
 1490 LDY R3L:BEQ mwdp
 1500.mwd1 DEY:LDA(R1L),Y:STA(
R2L),Y
 1510 CPY#0:BNE mwd1
 1520.mwdp LDX R3H:BEQ mwdx
 1530.mwd2 DEC R1H:DEC R2H
 1540.mwd3 DEY:LDA(R1L),Y:STA(
R2L),Y
 1550 CPY#0:BNE mwd3:DEX:BNE m
wd2
 1560.mwdx RTS
 1570.mvup
 1580 LDY#0:LDX R3H:BEQ mwup
 1590.mwu1 LDA(R1L),Y:STA(R2L)
,Y
 1600 INY:BNE mwu1
 1610 INC R1H:INC R2H:DEX:BNE
mwu1
 1620.mwup LDX R3L:BEQ mwux
 1630.mwu1 LDA(R1L);Y:STA(R2L)
,Y
 1640 INY:DEX:BNE mwu1
 1650.mwux RTS
 1660.insert
 1670 LDA R1L:STA SL:LDA R1H:S
TA SH
 1680 LDA zbuf+3:STA RL:LDA#0:
STA RH
 1690 LDA RL:BEQ renome
 1700 LDA R1L:CLC:ADC RL:STA R
2L
 1710 LDA R1H:ADC RH:STA R2H
 1720 JSR top
 1730 LDA RL:CLC:ADC R3L:STA Z
L
 1740 LDA RH:ADC R3H:STA ZH
 1750 JSR rechk
 1760 JSR x13:JSR sub13:JSR x1
3
 1770 LDA RH:BMI rmvup
 1780 JSR mvdn:JMP renome
 1790.rmvup
 1800 JSR mvup
 1810.renome
 1820 LDX zbuf+3:LDY#0
 1830.renlp
 1840 LDA zbuf,Y:STA(SL),Y
 1850 INY:DEX:BNE renlp
 1860 RTS
 1870.rechk
 1880 LDA ZL:SEC:SBC&6
 1890 LDA ZH:SBC&7:BCS retch
 1900 LDA ZL:STA&12:STA&0:STA&
2
 1910 LDA ZH:STA&13:STA&1:STA&
3
 1920 LDA&6:STA&4:LDA&7:STA&5
 1930 RTS
 1940.retch
 1950 JSR close
 1960 JSR eract
 1970 EQUB200:EQUS"LINE space"
:EQUB0
 1980.gkst2
 1990 INY
 2000.gkst
 2010 LDA (SL),Y
 2020 CMP#32:BEQ gkst2
 2030 CMP#ASC",":BEQ gkst2
 2040 CMP#13:RTS
 2050.ishx
 2060 CMP #ASC"A":BCC nu2
 2070 CMP #ASC"G"
 2080 RTS
 2090.isnu
 2100 CMP #ASC"0":BCC nu2
 2110 CMP #ASC"9"+1
 2120 RTS
 2130.nu2
 2140 SEC
 2150.nu5
 2160 RTS
 2170.islc
 2180 CMP #ASC"a":BCC nu2
 2190 CMP #ASC"z"+1
 2200 RTS
 2210.uc
 2220 JSR islc:BCS uc2
 2230 SEC:SBC#&20
 2240.uc2
 2250 RTS
 2260.mul
 2270 LDA#0:STA R3L:STA R3H
 2280.mula
 2290 LDX#16
 2300.ML CLC:ROR R2H:ROR R2L
 2310 BCC MC:JSR add13
 2320.MC CLC:ROL R1L:ROL R1H
 2330 DEX:BNE ML
 2340 RTS
 2350.add13
 2360 LDA R1L:CLC:ADC R3L:STA
R3L
 2370 LDA R1H:ADC R3H:STA R3H:
RTS
 2380.sub13
 2390 LDA R1L:SEC:SBC R3L:STA
R1L
 2400 LDA R1H:SBC R3H:STA R1H:
RTS
 2410.x13
 2420 LDA R1L:PHA:LDA R3L:STA
R1L
 2430 PLA:STA R3L
 2440 LDA R1H:PHA:LDA R3H:STA
R1H
 2450 PLA:STA R3H
 2460 RTS
 2470.dtbp
 2480 JSR gkst:BEQ dtff
 2490 LDA (SL),Y
 2500 JSR isnu:BCC dtnh
 2510 CMP#ASC"&":BEQ dtih
 2520.dtff
 2530 SEC:RTS
 2540.dtih
 2550 INY
 2560.gdtih
 2570 LDA#16:BNE dtal
 2580.dtnh
 2590 LDA#10
 2600.dtal
 2610 STA RL
 2620 LDA#0:STA R3L:STA R3H
 2630.dtbl
 2640 JSR x13
 2650 LDA#0:STA R2H:STA R3H
 2660 LDA RL:STA R2L
 2670 LDA (SL),Y:JSR isnu
 2680 BCC dtdc
 2690 LDA RL:CMP#16:BNE dtbx
 2700 LDA (SL),Y:JSR uc:JSR is
hx
 2710 BCS dtbx
 2720 SEC:SBC#ASC"A"-10:BNE dt
d2
 2730.dtdc
 2740 SEC:SBC#ASC"0"
 2750.dtd2
 2760 STA R3L:INY:JSR mula:JMP
 dtbl
 2770.dtbx
 2780 CLC
 2790 RTS
 2800.isesc
 2810 PHA
 2820 LDA#&80:BIT&FF:CLC:BEQ i
sec2
 2830 SEC
 2840.isec2
 2850 PLA
 2860.isec3
 2870 RTS
 2880.esc
 2890 JSR isesc:BCC isec3
 2900 JSR clesc
 2910.esce
 2920 JSR eract
 2930 EQUB17:EQUS"Escape":EQUB
0
 2940.clesc
 2950 LDA#126:JSR BY:SEC:RTS
 2960.eract
 2970 PLA:STA RL:PLA:STA RH
 2980 LDY#0:STY&100
 2990.eral
 3000 INY:LDA(RL),Y:STA &100,Y
 3010 BNE eral:JMP&100
 3020 ]:ENDPROC
```

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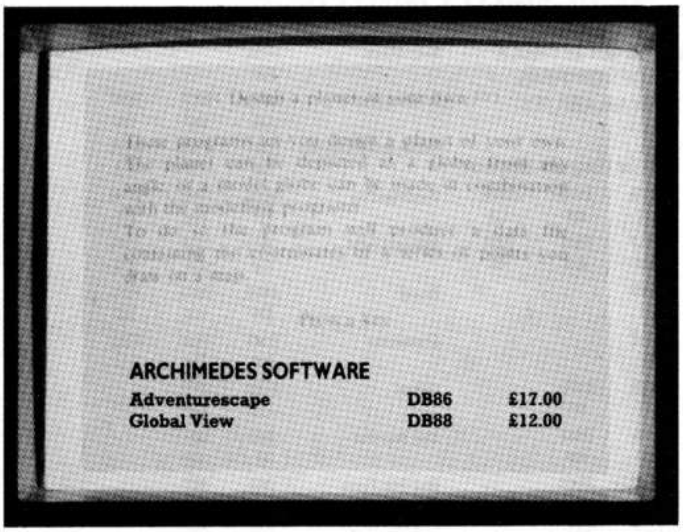
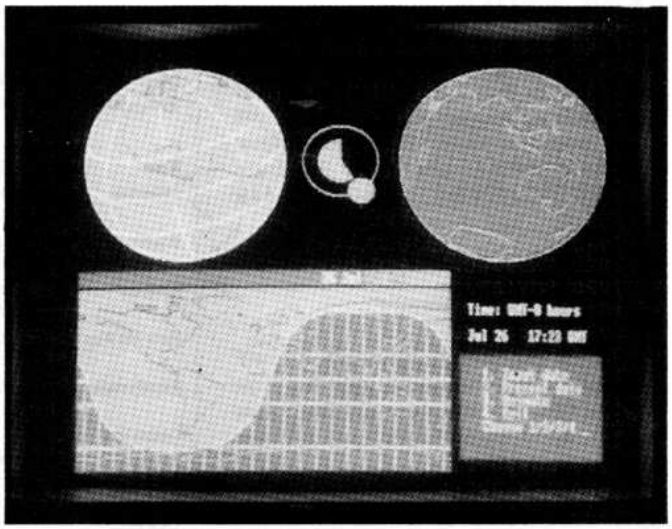
ADVENTURESCAPE – THE ADVENTURE WRITING SYSTEM

Adventurescape is supplied on two floppy discs.
Disk One: Adventurescape adventure generator locations descriptions puzzles dungeon adventure tutorial to be used in conjunction with the 20 page manual packaged with the software Murder at the Abbey, the classic whodunnit
Disc Two: Amnesia, massive adventure Xanadu, based on Coleridge's Kubla Kahn poem

The system consists of a 'shell' program which will run any one of a number of different adventure games, and two utility programs which provide friendly menu-driven editors to allow people to create the data files for a game of their own design.





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The adventure games which can be created include the following features:
(i) Up to 250 locations and 250 messages can be used. The descriptions may be lengthy and the total text far exceed the memory capacity of the computer, since these files are accessed directly from disc while the games are run.
(ii) Locations are connected by pointers allowing one way exits, twisty passages, mazes etc to be constructed.
(iii) Objects may be examined leading to messages which expand upon their usual description.
(iv) A very wide range of puzzles may be constructed using the unique puzzle generator of Adventurescape as will be explained in detail below.

What is more, this package includes no fewer than three sample games written with the system: Murder at the Abbey, Lost in Xanadu and Amnesia, in addition to the files of a short demo game 'Dungeon' whose construction is explained as a fully worked example in the manual.

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NEW>>>NEW>>>NEW>>>NEW

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NEW>>>NEW>>>NEW>>>NEW

Screenmaster

Video effects software

Professional video effects and advanced image processing. These machine code routines can be used to process any Mode 0, 1 or 4 graphics and are especially designed for use with digitised pictures.

The * commands are easily programmable for enhancing your own programs with "slides", "bangs", "fades" and many other screen effects. Screens can of course be recorded realtime onto video tape to create title pages, information screens and interesting links between footage. Pictures can also be prepared for desk top publishing packages.

Also included is a set software which works directly with the Watford BBC video digitiser, offering user-friendly capture and animation of digitised images.

All in all, this is the most comprehensive suite of software for manipulating digitised images on the BBC Micro.

DISK USER SOFTWARE BACK ISSUES

Issues one, two, three and four are available as laserset

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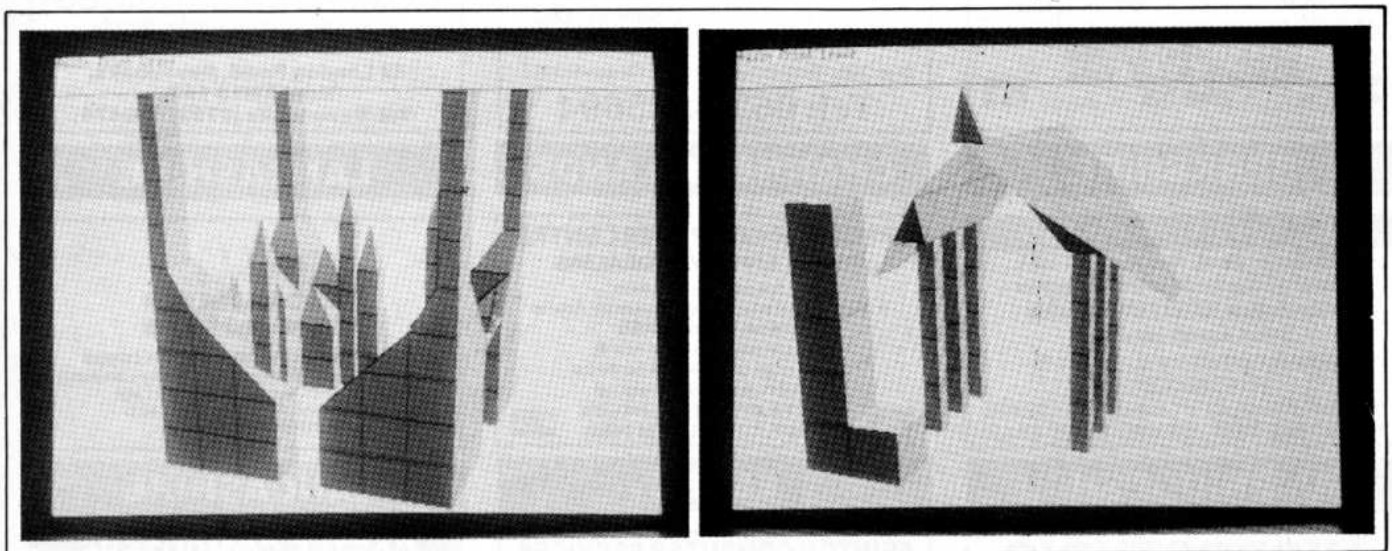

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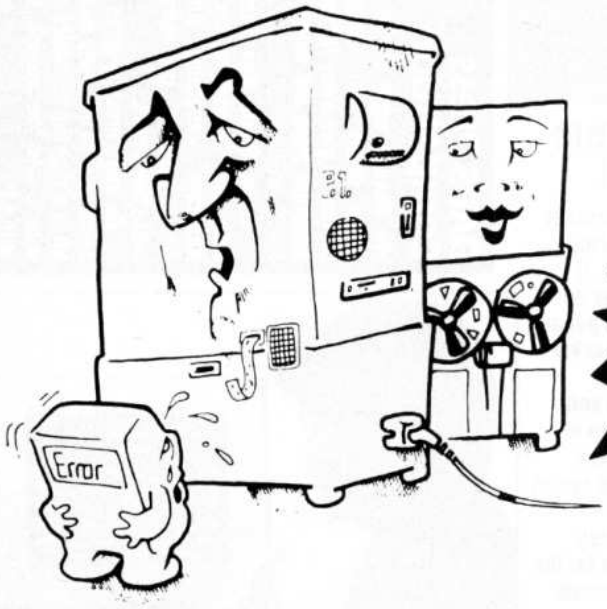

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Home micro users are often criticised for being solitary creatures only interested in communing with their computers. This is, of course, a totally unfair stereotype and if I didn't have an important 3-D computer cribbage game to finish I would hunt down these critics and sort them out.

If however you are one of the tiny minority of obsessed computer owners whose world has imploded since the advent of home computing there are organisations you can get involved with. These activities will bring you out of yourself, bring you into contact with others and best of all you might be able to bring along your computer too.

The Global Random Number Project

This group aims to support and encourage random number fans from all over the world. Members attend irregular conventions, swop randomly generated numbers and once or perhaps twice a year take part in the Numberthon, a gruelling but jolly mass attempt to produce an even bigger random number than the previous year.

The Mouse Sanctuary

A voluntary organisation devoted to rescuing mice and other hardware from the cruel amateur experiments of their owners. Who has not been horrified at one time or another by the sight of a stricken BBC with its casing removed and electrodes and add-ons protruding in all directions? You can play your part in ending these practices. The Mouse Sanctuary would like to make it clear however that they are in no way affiliated to the more radical Mouse Liberation Front, a bring-your-own-balaclava outfit that have recently made headlines storming spare bedrooms in suburbia to liberate maltreated peripherals.

Multi-User Games

These games put you in touch with lots of fun people who are trying to kill you. It works like this. Pay your entrance fee, get on line, and you are issued with a medieval sounding name like Lance the Percival, Morgrim the Magician or Tubgnarl the Troll. Next, you are allocated some low-level magic powers like being able to blow out candles from two feet away and open doors with only one hand. Armed with this bulging pouch of puny spells you are ready to set off into a vast, mysterious maze where within seconds you are torn apart by some steaming monster straight from the pit of hell. You have just met one of your fellow players.

There are new variations on the theme, one of the most popular being the Multi-User Space Game. It works like this. Pay your entry fee, get on line, and you are issued with a futuristic cyborg sounding name like Lance the Percivalatron, Morgrim the Mutant or Tubgnarl the Trolloid. Next you can choose which high-tech weapons you can take onto the first level such as a miniature hand-held microwave oven, heat-seeking sun ray lamp rifle or long range sonic bleeper. You are then ready to enter the vast, mysterious space station. You survive the first few seconds. Your android sensors registor no danger. Other androids amble jekily along the corridors like metal-coated Charlie Chaplins. You ask a friendly-looking robot the way to the nuclear reactor. It points to a door. You enter a tiny room. You can see the drone robot waving through the porthole as he recedes rapidly and you are jettisoned through the airlock into the black void of space. Yes, you've just said goodbye to another player.

These early encounters may seem a little offputting but with perseverance you can get into these games and become a success. After a while other players will want to get to know you and be your friend. It costs nothing to be chummy so why not invite them back to your airlock for a blow out?

A&B COMPUTNIG PAGE

The World of A&B-Part Two

Last month we saw what goes on at an editorial meeting in the A&B HQ. This month we look at Program commissioning.

Here we see Mark telling a defector from Database all about A&B house style. Although the little chap appears to quibbling over money.

Can't see why, two bunches of bananas seems more than adequate as payment for an Arc/PC/Cray 1 Emulator listing for the Electron!

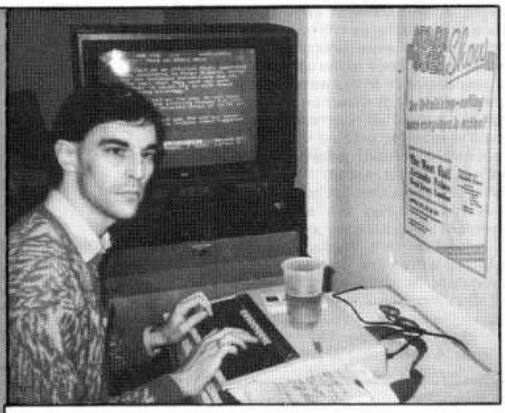
Ha Ha Atari!

Nice little A&B scam occurred at a Database Atari User Show a while back.

It was publisised that live show reports from the show were going straight onto Micronet. "Wow!" everyone thought ST's must be really good at comms to do live Micronet news coverage.

Wrong!

In actual fact this area of the show was under the control of none other that our very own **David Janda** and did he use the wealth of 16 bit technology around him? No he used his trusty Beeb set-up as this *Vogonvision*™ Screen dump proves.



DABS Press Competition

We Have a copy of the DABS Press shoot 'em smash hit Alerion to give away for the best Anagram from the words DABS PRESS ALERION.

Bruce Smith has come up with one thanks to his Mac Anagram Generator program which uses all the letters to make two words.

An extra mystery prize if you come up with the same one. As a bit of a clue the first word begins with L and the second begins with a P.

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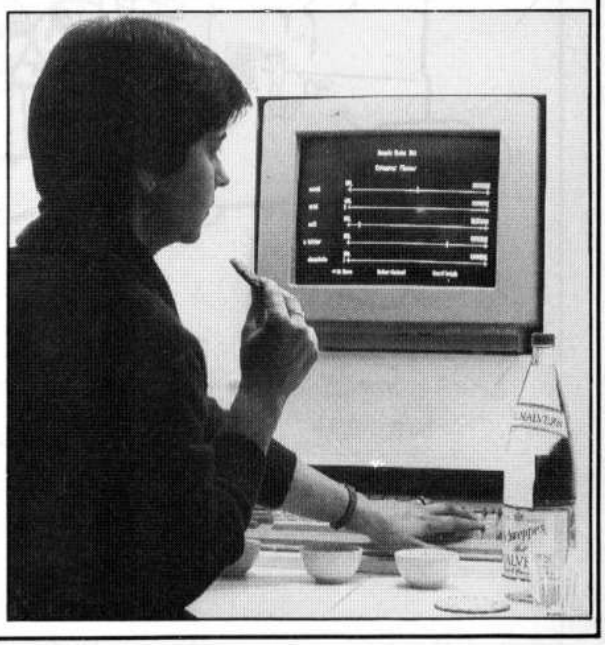
They have traded in their Winchesters and floppies for the revolutionary new *Digestidata* Direct-to-Biscuit system.

This involves photo-etching data onto a digestive bicky which, once loaded into your micro can be eaten, rendering it uncopyable. Capacity of each digestidata disk is roughly eight bites per cookie although a double density custard cream version is coming up.

We wait in anticipation.



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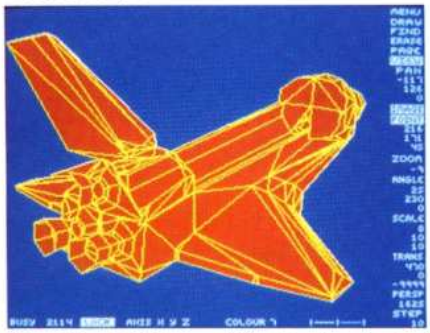

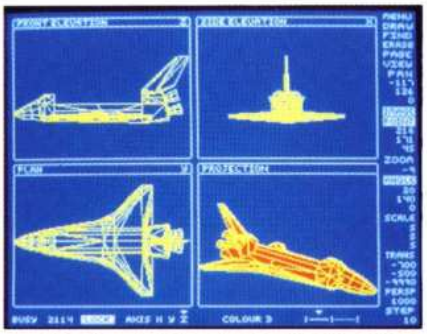

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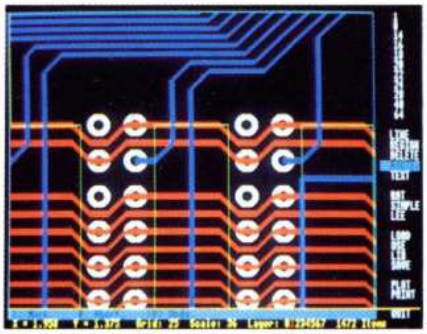

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